
REVISION OF THE *APOCEPHALUS PERGANDEI*-GROUP OF ANT-DECAPITATING FLIES (DIPTERA: PHORIDAE)

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ABSTRACT. The monophyletic *Apocephalus pergandei*-group is revised and found to include 63 species, including the following 45 new to science: *A. aequalis*, *A. albiapex*, *A. altus*, *A. amplexus*, *A. anacurvus*, *A. aquilonius*, *A. arachnes*, *A. astrictus*, *A. barbarus*, *A. brevitergum*, *A. bulbosus*, *A. carcinus*, *A. cinereus*, *A. clarilocus*, *A. collatus*, *A. commensuratus*, *A. concisus*, *A. ctenicoxa*, *A. cyathus*, *A. epicautus*, *A. euryterminus*, *A. fernandezi*, *A. flexiseta*, *A. frameatus*, *A. fuscipex*, *A. glomeratus*, *A. hippurus*, *A. hystricosus*, *A. inaffectus*, *A. latiapex*, *A. medius*, *A. opimus*, *A. planus*, *A. platycauda*, *A. pluteus*, *A. ponderosus*, *A. radiatus*, *A. reburrus*, *A. rotundus*, *A. rugosus*, *A. sharkeyi*, *A. sincerus*, *A. staurotus*, *A. superatus*, and *A. vangus*. The species *A. sagittarius* Borgmeier is placed in synonymy with *A. vicinus* Borgmeier (new synonymy).

INTRODUCTION

The genus *Apocephalus* is a large group of phorid flies that are nearly all parasitoids of ants (Hymenoptera: Formicidae). General information about the genus, including its classification into subgroups was given by Brown (1997), but in general they are small, dark brown to yellow flies, usually 1–5 mm in length, with dark, sclerotized, parasitic-type ovipositors (Plate 1). They are called “ant-decapitating flies” because the larvae, which feed inside the head capsule of the host, sometimes cause the head of the ant to fall off before the rest of the body stops moving (Fox, 1888; Pergande, 1901), but this name is used for species of other genera as well. Species of *Apocephalus* are found almost exclusively in the New World.

The *Apocephalus pergandei*-group includes the type species of the genus and the original ant-decapitating fly whose behavior was reported by Fox (1888) and Pergande (1901). Adult female flies attack ant hosts by hovering over them and darting down to lay an egg in (not on, as is frequently misreported) the body of the host ant. All species with known hosts attack ants of the genus *Camponotus* Mayr, with the exception of one new species that was attracted to crushed *Pachycondyla impressa* (Roger, 1861) (Table 1).

The last treatment of all species in this group was Borgmeier's (1971) key to the genus *Apocephalus*; since then no new species have been described. As part of my long-term revision of this genus (Brown, 1993, 1994, 1996, 1997, 2000), I studied all the previously described *A. pergandei*-group species and described the newly discovered material.

METHODS AND MATERIALS

METHODS

Terms for phorid morphology are those of the Manual of Nearctic Diptera (McAlpine, 1981). The nomenclature of ant species was checked against the most recent catalog (Bolton, 1995), in which references for ant names can also be found.

Statistics were calculated for the frons and for wing venation, namely mean frontal and mean costal ratios. The frontal ratio is the height of the frons divided by the width of the frons. The costal ratio is the distance from the basicosta to the apex of the costa, divided by the distance from the basicosta to the apex of the wing.

Geographical coordinates usually are quoted as decimal degrees, rather than degrees, minutes, and seconds (e.g., 90.50°W, rather than 90°30'W; Crawford, 1983).

The term “ALAS” in the lists of specimens examined refers to the Arthropods of La Selva (Costa Rica) project (Longino, 1994). Codes from the ALAS project, for example “M/04/067,” refer to Malaise trap (M; L for light trap), trap number (04), and sample number (067). “CAP” refers to the Colombia Arthropod Project that is being conducted by Michael Sharkey, collaborators in Colombia, and myself; “CAP-299” refers to sample number 299 in this survey.

In addition to the usual insect labels recording locality

information, barcoded insect labels were affixed to specimens (Thompson, 1994) and data were recorded in a database. All barcoded labels that begin with the abbreviation “LACM ENT” indicate that the data are stored in the Natural History Museum of Los Angeles County (LACM). Specimens with barcoded labels beginning “IN-BIO” have their data stored at LACM and the Instituto Nacional de Biodiversidad in Costa Rica. To make later recognition of holotypes easier, I list their individual barcode number in square brackets.

Phylogenetic relationships depicted in cladograms (Figs. 1, 2) were derived by hand, based on characters 1–16 listed in Classification section under Systematics. All characters were consistent within the defined groups.

MATERIALS

This revision is based on female specimens. In some species there are described male specimens, but many were questionably associated with the females. The only males that I newly recognize are of *A. horridus* Borgmeier and *A. wirthi* Borgmeier, both of which are extremely distinctive and which do not co-occur with species with which they could be confused.

Specimens belong to the following institutions (codens from Arnett et al., 1993; curator or collection manager names are in parentheses):

- AMNH Department of Entomology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192, USA (D. Grimaldi).
- BHMH Laboratório de Ecologia e Comportamento de Insetos, Departamento de Biologia Geral, ICB-UFMG, C.P. 486, 30.161-970, Belo Horizonte, MG, Brazil (R. Parentoni Martins).
- BMNH Department of Entomology, The Natural History Museum, London SW7 5BD, United Kingdom (J. Noyes).
- CASC Department of Entomology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118, USA (N. Penny).
- CMNH Section of Invertebrate Zoology, Carnegie Museum of Natural History, 900 Forbes Avenue, Pittsburgh, PA 15213, USA (C. Young).
- CNCI Biosystematics Research Centre, Agriculture Canada, Central Experimental Farm, Ottawa, Ontario, Canada K1A 0C6 (J.M. Cumming).
- CUMZ University Museum of Zoology, Downing Street, Cambridge CB3 2EJ, United Kingdom (R.H.L. Disney).
- DEBU Department of Environmental Biology, University of Guelph, Guelph, Ontario, Canada N1G 2W1 (S.A. Marshall).
- DENH Department of Entomology, University of New Hampshire, Durham, NH 03824, USA (D.S. Chandler).
- EMUS Department of Biology, Utah State University, Logan, UT 84322-5305, USA (W.J. Hanson).
- FSCA Florida State Collection of Arthropods, 1911 SW 34th Street, Gainesville, FL 32608-1268, USA (G. Steck).
- INBC Instituto Nacional de Biodiversidad, A.P. 22-3100, Santo Domingo, Heredia, Costa Rica (M. Zumbado).
- INPA Instituto Nacional de Pesquisas da Amazônia, Estrada do Aleixo, 1756, C.P. 478, 69.011, Manaus, Brazil (J. Rafael).

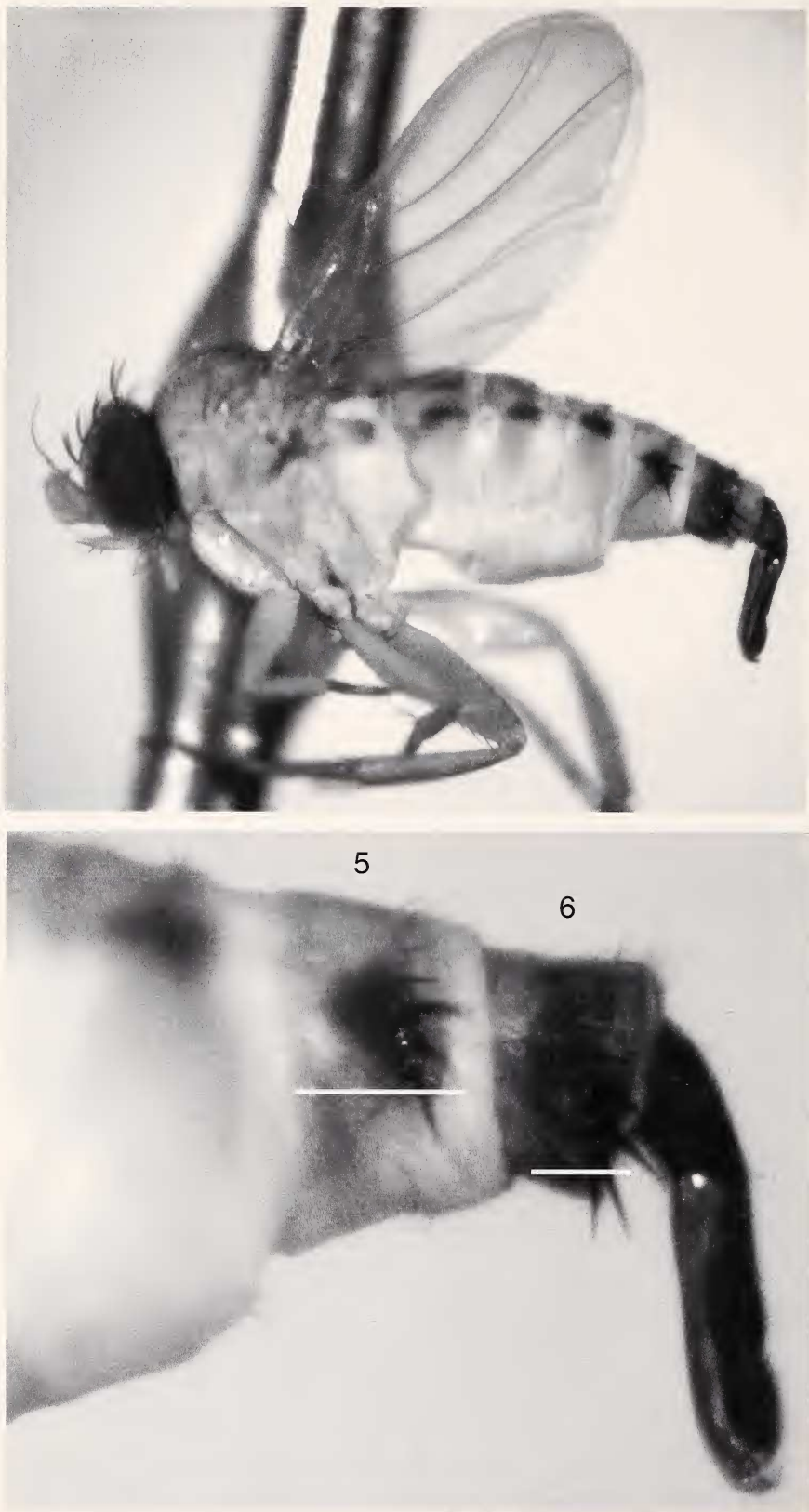


Plate 1 *Apocephalus pergandei* Coquillett, ♀, Huntley Meadows, Virginia, left lateral. Top, habitus. Bottom, posterior segments of abdomen. Symbols: 5, segment 5; 6, segment 6; white bars, ventral limit of abdominal tergites

Table 1 Host-parasite list. References refer to published record or to new information in this paper.

Host	Parasite	Reference
<i>Camponotus cingulatus</i>	<i>A. bispinosus</i>	Borgmeier, 1928
<i>C. crassus</i>	<i>A. crucicauda</i>	New record
<i>C. crassus</i>	<i>A. setiventris</i>	Borgmeier, 1971
<i>C. ferrugineus</i>	<i>A. coquilletti</i>	New record
<i>C. pennsylvanicus</i>	<i>A. concisus</i>	New record
<i>C. pennsylvanicus</i>	<i>A. coquilletti</i>	Brues, 1904 (as <i>A. pergandei</i>); new record
<i>C. pennsylvanicus</i>	<i>A. pergandei</i>	Pergande, 1901; new record
<i>C. rufipes</i>	<i>A. lanceatus</i>	Borgmeier, 1925
<i>C. rufipes</i>	<i>A. camponoti</i>	Borgmeier, 1925
<i>C. sansabeanus</i>	<i>A. similis</i>	Brues, 1904 (as <i>A. pergandei</i>); new record
<i>C. vicinus</i>	<i>A. horridus</i>	New record
<i>Pachycondyla impressa</i>	<i>A. collatus</i>	New record

LACM Entomology Section, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, CA 90007, USA (B.V. Brown).

MCZC Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138, USA (on indefinite loan to B.V. Brown).

MIUP Museo de Invertebrados Graham B. Fairchild, Universidad de Panama, Estafeta Universitaria, Panama (D. Quintero).

MUCR Museo de Insectos, Universidad de Costa Rica, San Pedro, San José, Costa Rica (P. Hanson).

MUSM Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Av. Arenales, 1267, Apartado 14-0434, Lima-14, Peru (G. Lamas).

MZSP Museu de Zoologia, Universidade de São Paulo, Av. Nazaré 481, C.P. 7172, 01051, São Paulo, Brazil (F.C. do Val).

NHRS Naturhistoriska Riksmuseet, Sektionen för Entomologi, S-10405, Stockholm, Sweden (T. Pape).

NYSM New York State Museum, Biological Survey, Room 3132, Cultural Education Center, Albany, NY 12230, USA (J.K. Barnes).

QCAZ Quito Catholic Zoology Museum, Departamento de Biología, Pontificia Universidad Católica del Ecuador, 12 de Octubre y Carrion, Apto. 2184, Quito, Ecuador (G. Onore).

SEMC Snow Entomological Museum, University of Kansas, Lawrence, KS 66044, USA (R. Brooks).

UMRM W.R. Enns Entomological Museum, 1-87 Agriculture Building, University of Missouri, Columbia, MO 65201, USA (R. Sites).

UNCB Museo de Historia Natural, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Apto. 7495, Santa Fé de Bogotá, Colombia (E. Flores).

USNM United States National Museum, Smithsonian Institution, Washington, DC 20560, USA (on indefinite loan to B.V. Brown).

WSUC M.T. James Entomological Collection, Department of Entomology, Washington State University, Pullman, WA 99163, USA (R. Zack).

Some characters, however, indicate the following subgroupings that I use as a provisional classification (see cladograms: Figs. 1, 2).

Two main subgroups are recognized: the monophyletic *A. pergandei*-subgroup and the possibly nonmonophyletic *A. lanceatus*-group. Within the *A. pergandei*-subgroup, I further recognize the *A. hispidus*-series and the *A. pergandei*-series. Within each of these groups are smaller subgroupings, discussed below.

Character states used to construct cladograms are as follows; hypothesized primitive states are given in parentheses.

1. Tergite 6 broader (extending farther laterally and ventrally on segment; Plate 1, Bottom) and markedly longer than tergite 5 (tergite 6 equal in length and width or narrower than tergite 5).
This character state defines the *A. pergandei*-group.
2. Sternite 6 extremely large (e.g., Fig. 14), occupying much of venter of segment (sternite 6 at most occupying a small portion of segment 6).
This character state defines the *A. pergandei*-subgroup.
3. Abdominal segment 6 with ventrobasal process (Figs. 12–17) (process absent).
4. Venter of abdomen with numerous scattered setae (Figs. 12–17) (setae fewer, usually organized into posterior rows).
Dense ventral setae are also found in *A. reburus* new species (Fig. 18), but they are hypothesized to be independently derived.
These two character states (3 and 4) define the *A. hispidus*-series.
5. Ovipositor with lateral clear areas devoid of sclerotization (Figs. 4–6) (clear areas absent).
This character state defines the *A. hispidus*-subseries.
6. Ovipositor with anteroventral process (Fig. 7) (process absent).
This character state defines a group contain-

SYSTEMATICS

CLASSIFICATION

At this time I have insufficient information to provide a detailed phylogenetic revision of this group.

ing *A. hispidus* Borgmeier, *A. frameatus* new species, and *A. hippurus* new species.

7. Ventral apex of ovipositor laterally expanded (Figs. 9, 10) (apex narrow).
8. Ventrobasal process of abdominal segment 6 greatly expanded (Figs. 15, 16) (process smaller, narrower).
9. Posterolateral setae of ventrobasal process greatly enlarged, thickened, blunt (Figs. 15, 16) (setae, if large, long and pointed).

Character states 7–9 define a sister-group relationship between *A. aculeatus* Borgmeier and *A. hystricosus* new species.

10. Venter of ovipositor curved dorsally along edges (Fig. 42) (ventral sclerite not curved dorsally).

This character state defines the *A. pergandei*-series.

11. Posterolateral setae of tergite 6 extremely enlarged, bristlelike (posterolateral setae subequal to other setae of tergite 6).

This character state defines a group composed of all *A. pergandei*-series species except *A. collatus* new species, *A. concisus* new species, *A. cyathus* new species, *A. glomerosus* new species, and *A. staurotus* new species (Fig. 2).

12. Posteroventral setation of abdominal segment 6 consists of extremely small setae with large sockets (either large setae with large sockets or small setae with small sockets present).

This character state defines a group containing *A. coquilletti* Malloch, *A. disparicauda* Borgmeier, *A. camponoti* Borgmeier, *A. crucicauda* Borgmeier, *A. reburrus*, and all *A. pergandei*-subseries species (Fig. 2).

13. Ovipositor apically expanded (Figs. 25, 26) (ovipositor apically narrowed).

This character state defines a sister-group relationship between *A. coquilletti* and *A. disparicauda*.

14. Ovipositor with well-developed, dorsomedial, bicarinate ridge (e.g., Figs. 31, 32) (ovipositor dorsally relatively flat).

This character state defines the *A. pergandei*-subseries. The ovipositor of *A. reburrus* also has a medial ridge, but it is structurally different from that of *A. pergandei*-subseries taxa, being smoothly rounded.

15. Apical sclerite of dorsum of ovipositor with anteriorly directed arm (Figs. 46, 47, 49) (sclerite, if present, without anteriorly directed processes).

This character state defines the *A. facettalis*-series.

16. Apex of ovipositor curved dorsally (Fig. 52) (apex straight or downturned).

This character state defines the *A. velutinus*-series.

TAXONOMY

Apocephalus Coquillett

Apocephalus Coquillett, 1901:501, fig. 1. Type species: *A. pergandei* Coquillett, by original designation.

Pseudoplastophora Schmitz, 1915:327, figs. 6, 7. Type species: *P. caudataria* Schmitz, by monotypy. Synonymized by Borgmeier, 1968.

Anaclinusa Borgmeier, 1969:63–64, figs. 35–37. Type species: *Anaclinusa lopesi* Borgmeier, by original designation. Synonymized by Brown, 2000.

Pleurophorina Borgmeier, 1969:66, figs. 40–42. Type species: *P. turgida* Borgmeier, by original designation. Synonymized by Brown, 1997.

Zyziphora Peterson and Robinson, 1976:119, figs. 1–5. Type species: *Z. hirtifrons* Peterson and Robinson, by original designation. Synonymized by Brown, 1992.

Apocephalus pergandei-group

DIAGNOSIS. Tergite 6 broader and longer than tergite 5, extended ventrolaterally on side of segment. Species with known hosts are almost all parasitoids of *Camponotus* ants.

Apocephalus pergandei-subgroup

DIAGNOSIS. Abdominal sternite 6 extremely large, occupying much of venter of segment.

Apocephalus hispidus-series

DIAGNOSIS. Abdominal segment 6 with ventrobasal process. Venter of abdomen with numerous scattered setae.

Apocephalus hispidus-subseries

DIAGNOSIS. Ovipositor with lateral clear areas devoid of sclerotization.

Apocephalus amplexus new species

(Figs. 4, 12)

REMARKS. This species is recognized by the broad, rounded ovipositor encircling the lateral clear areas (Fig. 4), and the large, triangular shape of the ventrobasal process of the venter of abdominal segment 6 (Fig. 12).

DESCRIPTION. Body length 1.4 mm. Frons blackish-brown. Frontal ratio 1.43. Flagellomere 1 dark brown, slightly lighter than frons, oval. Supra-antennal setae absent. Palpus yellow. Scutum yellowish-brown. Scutellum yellowish-brown. Anterior pair of scutellar setae three times length and two times thickness of posterior setae of scutum. Posterior pair of scutellar setae slightly greater in length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.45. Halter brown. Apex of hind femur without anterior or posterior dark spot, slightly darker than rest of femur. Abdominal tergites yellowish-brown, darker

laterally, tergite 6 brown. Venter of abdomen yellowish-brown. Ventrolateral setae of tergite 6 small, like dorsal setae. Venter of abdominal segments 1–4 bare, segment 5 with scattered thin setae. Venter of abdominal segment 6 with large triangular sclerite bearing few short, rounded setae at apex; apex protruding into unusual sclerotized area on intersegment 6–7. Ovipositor relatively rounded, with lateral clear areas bounded by darkening along lateral border. Ovipositor dorsally with two lines of small setulae and laterally with one seta.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for encircling, referring to the round ovipositor surrounding the medial clear areas.

HOLOTYPE. ♀, COSTA RICA: Limón: 16 km W Guapiles, 10.15°N, 83.92°W, viii–ix.1989, P. Hanson, Malaise trap, 400 m (LACM) [LACM ENT 012710].

Apocephalus frameatus new species

(Figs. 5, 13)

REMARKS. The abdomen of this species is extremely similar to that of *A. hispidus* Borgmeier, but differs by the broader median darkening of the ovipositor (Fig. 5) and the pointed, recurved process of the venter of abdominal segment 6 (Fig. 13).

DESCRIPTION. Body length 1.5–2.1 mm. Frons blackish-brown. Frontal ratio 1.06. Flagellomere 1 light brown, darker at apex, oval. Supra-antennal setae absent. Palpus yellow. Scutum yellowish-brown. Scutellum yellowish-brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and three times thickness of anterior pair. Pleuron yellow. Mean costal ratio 0.44. Halter yellowish-brown, slightly darker apically. Apex of hind femur without anterior or posterior dark spot. Abdominal tergites yellowish-brown, darker laterally, tergite 6 brown. Venter of abdomen yellowish-brown, segment 6 brown. Ventrolateral setae of tergites 5–6 not greatly enlarged. Venter of abdominal segments 1–3 bare, segment 4 with row of posterior seta, segment 5 with scattered setae. Venter of abdominal segment 6 with large, square sternite, narrow, anteriorly recurved process originating at base of segment, and scattered setae (Fig. 13). Ovipositor apically pointed, with lateral clear sections adjacent to relatively broad, median sclerotized strip. Venter of ovipositor with long, narrow process originating at base (as in Fig. 7).

GEOGRAPHICAL DISTRIBUTION. Southeastern USA.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for spear, referring to the stylet, which is broader than that of *A. hispidus*.

HOLOTYPE. ♀, USA: Florida: Okaloosa Co., Eglin Air Force Base, T1S-R25W-secs. 29 and 30, 18–20.ix.1995, Malaise trap, site 2C–E (FSCA) [LACM ENT 122250].

PARATYPES. USA: Florida: Lee Co., Sanibel Island, 2♀, 27.iv–3.v.1983, L. Carlson, B. Brown, dung traps (LACM), Wakulla Co., Ochlockonee River State Park, 1♀, 29.iv.1970, W.W. Wirth, Malaise trap (USNM); Georgia: Liberty Co., St. Catherines Island, 1♀, 18–21.ix.1972, F.C. and B.J. Thompson (AMNH).

Apocephalus hispidus Borgmeier

(Figs. 6, 7, 14)

Apocephalus hispidus Borgmeier, 1958:348–349, figs. 41, 50.

TYPES. 5♀, BRAZIL: Santa Catarina: Nova Teutonia, F. Plaumann (examined).

REMARKS. The abdomen of this species is most similar to that of *A. frameatus* but has a narrow median sclerotization of the ovipositor (Fig. 6) and a broad ventrobasal process of abdominal segment 6 (Fig. 14).

DESCRIPTION. Body length 1.6–2.3 mm. Frons blackish-brown. Frontal ratio 1.16. Flagellomere 1 light brown, darker at apex, oval, apically pointed. Supra-antennal setae absent. Palpus yellow. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.45. Halter yellow, anteroapical one-third brown. Apex of hind femur without anterior or posterior dark spot. Abdominal tergites brown, tergites 4 and 5 yellowish-brown anteriorly. Venter of abdomen yellow, segment 5 gray, segment 6 dark gray. Ventrolateral setae of tergites 5–6 not greatly enlarged. Venter of abdominal segments 1–3 bare, segment 4 with row of posterior seta, segment 5 with scattered setae. Venter of abdominal segment 6 with large, square sternite, broad process originating at base of segment, and scattered setae (Fig. 14). Ovipositor apically pointed, with lateral clear sections adjacent to thin, median sclerotized strip. Venter of ovipositor with long, narrow process originating at base (Fig. 7).

GEOGRAPHICAL DISTRIBUTION. Costa Rica to southeastern Brazil.

OTHER MATERIAL EXAMINED. COSTA RICA: Alajuela: San Ramon, 10.22°N, 84.62°W, 2♀, viii–ix.1995, P. Hanson, Malaise trap, 900 m (LACM); Cartago: Turrialba, 9.93°N, 83.67°W, 1♀, 15–19.vii.1965, P. Spangler (USNM); Guanacaste: 3 km SE Rio Naranjo, 1♀, 1–10.vii.1992, F.D. Parker (EMUS); Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 2♀, 15.iv.1993, ALAS, Malaise trap M/01/064, 1♀, 15.vii.1993, ALAS, Malaise trap M/04/155, 1♀, 1.xi.1993, ALAS, Malaise trap M/08/254, 2♀, 31.v.1996, ALAS, Malaise trap M/01/651, 24♀, 3.iv.2000, ALAS, Malaise trap M/19/745 (INBC, LACM, MCZC, NHRS, SEMC, USNM); Puntarenas: 5 km W Piedras Blancas, 8.77°N, 83.28°W, 3♀, x.1991, P. Hanson, Malaise trap, 100 m (LACM), 24 km W

Piedras Blancas, 8.77°N, 83.4°W, 18♀, iii–v.1989, 3♀, x.1990, P. Hanson, Malaise trap, 200 m (LACM, MUCR), 23 km W Puerto Jimenez, 8.67°N, 83.45°W, 1♀, vi.1991, P. Hanson, Malaise trap, 10 m (LACM), San Vito, Las Cruces, 8.78°N, 83.0°W, 2♀, iii.1988, P. Hanson, Malaise trap (LACM). ECUADOR: Pichincha: 17 km E Santo Domingo, Tinalandia, 1♀, 6–13.v.1987, B.V. Brown, clubhouse windows, 710 m (LACM). PANAMA: Canal Zone, Barro Colorado Island, 9.17°N, 79.83°W, 1♀, 1–7.iv.1993, J. Pickering, Malaise trap #936 (MIUP).

Apocephalus hippurus new species

(Fig. 8)

REMARKS. The ovipositor of this species is similar to those of *A. frameatus* and *A. hispidus* but differs by the forked apex (Fig. 8) and forked ventrobasal process.

DESCRIPTION. Body length 1.9–2.1 mm. Frons blackish-brown. Frontal ratio 1.06. Flagellomere 1 light brown, darker at apex, oval. Supra-antennal setae absent. Palpus yellow. Scutum yellowish-brown. Scutellum yellowish-brown. Anterior pair of scutellar setae three times length and two times thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.46. Halter yellowish-brown, brown anteroapically. Apex of hind femur without anterior or posterior dark spot. Abdominal tergites dark brown, tergites 2–5 yellowish-brown anteromedially. Venter of abdomen yellowish-brown, segment 6 brown. Ventrolateral setae of tergite 6 small. Venter of abdominal segments 1–3 bare, segment 4 with posterior row of thin setae, segment 5 with scattered, long setae that extend dorsolaterally. Venter of abdominal segment 6 with large, elongate, apically rounded ventral sclerite. Ovipositor elongate, similar to that of *A. hispidus* (Fig. 7), but with apical forked process (Fig. 8) and with ventrobasal process apically forked.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Amazonian Ecuador.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for a type of fish, referring to the fishtail-shaped apex of the ovipositor.

HOLOTYPE. ♀, ECUADOR: Sucumbios: Sacha Lodge, 0.5°S, 76.5°W, 3–13.vii.1994, P. Hibbs, Malaise trap, 270 m (LACM) [LACM ENT 042303].

PARATYPE. ECUADOR: Sucumbios: Sacha Lodge, 0.5°S, 76.5°W, 1♀, 25.vii–3.viii.1994, P. Hibbs, Malaise trap, 270 m (LACM).

Other *Apocephalus hispidus*-series

Apocephalus aculeatus Borgmeier

(Figs. 9, 15)

Apocephalus aculeatus Borgmeier, 1925:198–199, figs. 27, 28.

HOLOTYPE. ♀, Brazil: Rio de Janeiro: Petropolis, 3.ii.1923, T. Borgmeier [LACM ENT 147584] (examined; MZSP).

REMARKS. This species is easily recognized by the large, bifurcate process of the venter of abdominal segment 6 (Fig. 15).

DESCRIPTION. Body length 2.5 mm. Frons dark brown. Frontal ratio 1.26. Flagellomere 1 orange basally, with dark anterior apex, oval. One pair of distinct, but small, supra-antennal setae present. Palpus yellow. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae slightly thicker and longer than posterior setae of scutum. Posterior pair of scutellar setae four times length and thickness of anterior pair. Pleuron light brown. Mean costal ratio 0.49. Halter brown. Apex of hind femur without anterior or posterior dark spot. Abdominal tergites yellowish-brown, darker laterally, tergite 6 brown. Venter of abdomen yellowish-brown, segment 6 brown. Abdominal segment 6 with one large ventrolateral seta. Venter of abdominal segments 1–3 bare, segment 4 with posterior row of setae, segment 5 with scattered long setae. Venter of abdominal segment 6 with broad, forked process originating at base of segment; posteriorly with scattered long setae. Ovipositor slightly downturned, dorsal apex pointed. Ventral apex much longer than dorsal, slightly broadened distally (Fig. 9). Dorsum of ovipositor with rows of small setulae.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southeastern Brazil.

Apocephalus hystricosus new species

(Figs. 10, 16)

REMARKS. This species can be recognized easily by the greatly enlarged ventrobasal process and blunt, thick setae of the venter of abdominal segment 6 (Fig. 16), as well as by the short, thick setae of the posterior tergites and the broad ventral apex of the ovipositor (Fig. 10). The latter character is shared by *A. reburrus* new species, which lacks the thickened setae and is otherwise different in appearance.

DESCRIPTION. Body length 2.3–2.4 mm. Frons blackish-brown. Frontal ratio 1.08. Flagellomere 1 yellow with apical dark spot, oval. Supra-antennal setae absent. Palpus yellow. Scutum yellowish-brown. Scutellum yellowish-brown. Anterior pair of scutellar setae slightly thicker and longer than posterior setae of scutum. Posterior pair of scutellar setae three times length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.45. Halter yellowish-brown, anteroapical half brown. Apex of hind femur without anterior or posterior dark spot. Abdominal tergites yellowish-brown, darker laterally. Venter of abdomen yellowish-brown, segment 6 brown. Dorsum of abdominal segment 6 with short, thick setae that are longer and closer to lateral margin; posteroventrally with lobelike projection bearing short, thick, blunt seta.

Venter of abdominal segments 1–3 bare, segment 4 with short, scattered setae and posterior row of longer setae, segment 5 with oval, medial sclerite. Venter of segment 6 almost completely covered by extensive, broad process originating at base of segment; process with few short, blunt setae and scattered small setulae (Fig. 16). Ovipositor with relatively lightly sclerotized anterior portion and heavily sclerotized, dorsally tridentate posterior portion (Fig. 10). Ventral apex of ovipositor extremely broad, with laterally pointed apices.

GEOGRAPHICAL DISTRIBUTION. Southern Costa Rica to Panama.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for thorny, referring to the short, thick setae of the abdomen.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: 24 km W Piedras Blancas, 8.77°N, 83.40°W, xii.1991, P. Hanson, Malaise trap, 200 m (LACM) [LACM ENT 013115].

PARATYPES. COSTA RICA: Puntarenas: Cerro Rincon, 8.52°N, 83.47°W, 1♀, ii.1991, P. Hanson, Malaise trap, 745 m (INBC), 24 km W Piedras Blancas, 8.77°N, 83.40°W, 1♀, ii–iii.1989, P. Hanson, Malaise trap, 200 m (LACM). PANAMA: Canal Zone, Barro Colorado Island, 9.17°N, 79.83°W, 1♀, 3–10.iii.1993, J. Pickering, Malaise trap #932 (LACM).

Apocephalus vangus new species

(Figs. 11, 17)

REMARKS. This species is recognized by the distinctively shaped ovipositor, especially the concave posterior section (Fig. 11).

DESCRIPTION. Body length 2.4 mm. Frons blackish-brown. Frontal ratio 1.03. Flagellomere 1 yellow with apical dark spot, oval. Supra-antennal setae absent. Palpus yellow. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.47. Halter brown. Apex of hind femur without anterior or posterior dark spot. Abdominal tergites yellow, darker laterally. Venter of abdomen yellowish-brown, segment 6 brown. Ventrolateral setae of tergite 6 not larger than other lateral setae. Venter of abdominal segments 1–3 bare, segment 4 with scattered, small, posterior setae, segment 5 with scattered setae. Venter of abdominal segment 6 with triangular process originating from base of segment and posterior scattered setae (Fig. 17). Ovipositor dorsally concave, narrowing posteriorly to rounded apex. Ventral apex slightly narrower than dorsal apex, subequal in length. Dorsum of ovipositor with two rows of setulae and two lateral setae on each side.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The

name is Latin for spade, referring to the scoop-shaped ovipositor.

HOLOTYPE. ♀, COSTA RICA: Guanacaste: 14 km S Cañas, 26–30.vii.1990, F.D. Parker, [Malaise trap] (LACM) [LACM ENT 087585].

Apocephalus pergandei-series

DIAGNOSIS. Venter of ovipositor curved dorsally along edges (Fig. 42).

Apocephalus collatus new species

(Fig. 19)

REMARKS. The ovipositor of this species is easily recognized by its elongate, narrow shape (Fig. 19).

DESCRIPTION. Body length 2.7–3.1 mm. Frons blackish-brown. Frontal ratio 1.04. Flagellomere 1 light brown, oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown; dark brown posteromedially. Scutellum brown. Anterior pair of scutellar setae one and one-half times length and about equal thickness of posterior setae of scutum. Posterior pair of scutellar setae two and one-half times length and three times thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.54. Halter blackish-brown, with narrow yellow marking. Apex of hind femur without anterior or posterior dark spot. Tergites 1–5 blackish-brown, lightened anteriorly, posteriorly, and medially; tergite 6 blackish-brown, lightened anteriorly. Venter of abdomen yellowish-brown; segment 5 medially brown, segment 6 brown. Ventrolateral setae of tergite 6 slightly enlarged. Venter of abdominal segments 1–3 bare; segment 4 with few thin setae; segments 5–6 with large, square, lightly sclerotized sternites and thicker posterior setae. Ovipositor elongate, narrow, relatively parallel-sided; with thick lateral darkenings; apically with two rounded free sclerites. Ovipositor dorsally without large setae.

GEOGRAPHICAL DISTRIBUTION. Costa Rica.

HOST. One specimen was attracted to a crushed worker of *Pachycondyla impressa*. More research is necessary to determine if this is a normal host for *A. collatus*.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for extended, referring to the elongate ovipositor.

HOLOTYPE. ♀, COSTA RICA: Limón: 16 km W Guapiles, 10.15°N, 83.92°W, i–iv.1991, P. Hanson, Malaise trap, 400 m (LACM) [LACM ENT 013164].

PARATYPES. COSTA RICA: Guanacaste: Estación Cacao, 10.93°N, 85.47°W, 1♀, 30.vi.1997, B. Brown, J. Paldi, injured *Pachycondyla impressa* (LACM); Limón: 4 km NE Bribri, 9.63°N, 82.82°W, xii.1989–iii.1990, P. Hanson, Malaise trap, 50 m (LACM), 16 km W Guapiles, 10.15°N, 83.92°W, 1♀, iv–v.1989, 2♀, iii–v.1990, 1♀, i–iv.1991, 1♀, vi–ix.1991, P. Hanson, Malaise trap,

400 m (INBC, LACM, MUCR); Puntarenas: Cerro Rincon, 8.52°N, 83.47°W, 1♀, i.1991, P. Hanson, Malaise trap (LACM).

Apocephalus concisus new species

(Fig. 20)

REMARKS. The short, downturned ovipositor (Fig. 20) of this species is unusual for a member of the *A. pergandei*-series and makes it instantly recognizable.

DESCRIPTION. Body length 1.5–2.5 mm. Frons dark brown. Frontal ratio 0.99. Flagellomere 1 pale yellow, oval. Supra-antennal setae absent. Palpus pale yellow. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.47. Halter brown, with narrow yellow marking. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown, lighter anteriorly and posteriorly; tergite 2 light brown to brown, darker at lateral margins; tergites 3–4 light brown with lighter medial strip, dark brown laterally; or tergites 3–4 dark brown, light brown medially and along posterior margin; tergite 5 light brown, dark brown along lateral margins; tergite 6 brown to dark brown, with yellowish-brown anterior third. Venter of abdomen yellowish-brown; segments 2–5 sometimes grayish-brown laterally; segment 6 grayish-brown to brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare; segment 4 with row of thin setae; segment 5 with narrow, lightly sclerotized sternite and row of thicker setae; segment 6 with large, square sternite and row of posterior setae subequal in thickness to those in segment 5. Ovipositor short, expanded posteriorly, with broadly truncate apex. Ovipositor dorsally with two, small posterolateral setae.

GEOGRAPHICAL DISTRIBUTION. Southeastern USA.

HOST. I collected specimens of this species as they hovered over and darted at *Camponotus pennsylvanicus* (DeGeer, 1773) workers that were feeding at a tuna bait.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for short, referring to the shape of the ovipositor.

HOLOTYPE. ♀, USA: Missouri: Laclede Co., Bennett Springs State Park, 7–8.viii.1988, B.V. Brown, over *Camponotus pennsylvanicus* (LACM) [LACM ENT 010961].

PARATYPES. USA: Florida: Alachua Co., Gainesville, 1♀, 20.iv.1967, W.W. Wirth, Malaise trap (USNM); Georgia: Liberty Co., St. Catharines Island, 2♀ (and two possible males of this species, which I do not treat as paratypes), 24–28.iv.1972, Thompson and Picchi, 4♀, 18–21.ix.1972, F.C. and B.J. Thompson (AMNH); Maryland: Mont-

gomery Co., Colesville, 18.ix.1977, W.W. Wirth, Malaise trap (USNM), Plummer's Island, 4♀, 8.vii.1968, P.J. Spangler, Malaise trap (LACM, USNM); Missouri: Laclede Co., Bennett Springs State Park, 3♀, 7–8.viii.1988, B.V. Brown, over *Camponotus pennsylvanicus* (LACM), Wayne Co., Williamsville, 1♀, 16.vii–8.viii.1988, J.T. Becker, Malaise trap (CNCI).

Apocephalus cyathus new species

(Fig. 21)

REMARKS. This species is easily recognized by the form of the ovipositor (Fig. 21), which is ventrally curled at the apex.

DESCRIPTION. Body length 1.4–2.3 mm. Frons dark brown. Frontal ratio 1.08. Flagellomere 1 light brown to brown, pyriform. Supra-antennal setae absent. Palpus light brown. Scutum light brown anteriorly, darker posteriorly. Scutellum brown to dark brown. Pleuron yellowish-brown. Mean costal ratio 0.51. Apex of hind femur without anterior or posterior dark spot. Tergites dark brown with a lightened, narrow, medial strip on tergites 1–5; tergites 2–5 lightened anteriorly, with or without lightening on posterior margin; tergite 6 with or without lightening anteriorly. Venter of abdomen yellowish-brown, gray laterally and posteriorly. Ventrolateral setae of tergite 6 slightly enlarged. Venter of abdominal segments 1–3 bare; segment 4 with few thin setae; segments 5–6 with large, square, lightly sclerotized sternites and thicker posterior setae. Ovipositor expanded at apical one-third; lateral margins dark; apically with two rounded free sclerites. Apical third of ovipositor curved ventrally. Ovipositor dorsally without large setae.

GEOGRAPHICAL DISTRIBUTION. Tropical lowlands from Mexico to Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is based on a Greek word, *kyathos*, for cup, referring to the curved apex of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1–8.v.1989, B. Brown, D. Feener, Malaise trap, primary forest, CC 400 (LACM) [LACM ENT 013278].

PARATYPES. BRAZIL: Pará: Oriximiná, 1.8°S, 53.83°W, 1♀, 13.xi.1992, J. Rafael, Malaise trap (INPA); Roraima: Ilha de Maraca, 3.37°N, 61.43°W, 1♀, 20–30.iii.1987, L. Aquino, Malaise trap (INPA). COSTA RICA: Cartago: Cachi, 9.83°N, 83.80°W, 1♀, ix–x.1997, G. Chavez, Malaise trap, 1000 m (LACM); Guanacaste: Santa Rosa National Park, 10.95°N, 85.62°W, 1♀, 27.ix–18.x.1986, Malaise trap SE-5-O, 1♀, 18.x–8.xi.1986, Malaise trap SE-6-C, 1♀, 21.ii–14.iii.1987, D. Janzen, I. Gauld, Malaise trap, 300 m (LACM); Heredia: Chilamate, 1♀, v.1989, Malaise trap, P. Hanson (CMNH), La Selva Biological Station, 10.43°N, 84.02°W, 1♀, ii.1980, W. Mason (CNCI), 1♀, 15–21.v.1989, B. Brown, D. Feener, Malaise trap, SOR@SHO (LACM), 2♀, 21.i–

3.ii.1991, J. Noyes, Malaise trap (LACM), 1 ♀, iii.1991, 1 ♀, ix.1992, P. Hanson, Malaise trap (LACM), 6 ♀, 2–3.iii.1993, ALAS, Malaise trap M/01/016, M/05/020, M/10/025, M/14/029, 4 ♀, 15.iii.1993, ALAS, Malaise trap M/02/033, M/05/036, 2 ♀, 1.iv.1993, ALAS, Malaise trap M/05/52, 3 ♀, 1–15.iv.1993, ALAS, Malaise trap M/04/67, M/05/068 (INBC), 2 ♀, 18.v.1993, ALAS, Malaise trap M/01/096, M/02/097, 6 ♀, 15.v–1.vi.1993, ALAS, Malaise trap M/04/111, M/07/113, M/10/116, M/14/120 (INBC), 2 ♀, 22–24.vi.1993, B. Brown, D. Feener, Malaise trap #1, 1 ♀, 22–26.vi.1993, B. Brown, D. Feener, Malaise trap #4 (LACM), 3 ♀, 1.vii.1993, ALAS, Malaise trap M/06/151, M/09/143 (INBC), 6–11.vii.1993, B. Brown, D. Feener, Malaise trap #1 (LACM), 3 ♀, 15.vii–3.viii.1993, ALAS, Malaise trap M/01/164, M/08/170, 3 ♀, 1.xi.1993, ALAS, Malaise trap M/01/248, M/05/224, 1 ♀, 15.xi.1993, ALAS, Malaise trap M/05/268, 5 ♀, 3.ii.1994, ALAS, Malaise trap M/06/347, 2 ♀, 15.ii.1994, ALAS, Malaise trap M/05/352, M/11/357, 3 ♀, 1.iii.1994, ALAS, Malaise trap M/05/364, M/12/370, 1 ♀, 1.viii.1995, ALAS, Malaise trap M/05/415, 1 ♀, 2.i.1996, ALAS, Malaise trap M/01/531, 2 ♀, 1.ii.1996, ALAS, Malaise trap M/03/557, 1 ♀, 15.v.1996, ALAS, Malaise trap M/03/641, 1 ♀, 15.x.1997, ALAS, Malaise trap M/18/686, 1 ♀, 19.iii.1998, ALAS, Malaise trap M/18/704 (INBC); Limón: 4 km NE Bribri, 9.63°N, 82.28°W, 2 ♀, iv–vi.1990, 14 ♀, xii.1989–iii.1990, 2 ♀, vii–ix.1990, P. Hanson, Malaise trap, 50 m (LACM, MCZC, NHRS), 7 km SW Bribri, 9.58°N, 82.88°W, 6 ♀, ix–xi.1989, P. Hanson, Malaise trap (LACM), 16 km W Guapiles, 10.15°N, 83.92°W, 1 ♀, ii.1989, 1 ♀, iii.1989, 1 ♀, v–vi.1990, 4 ♀, i–iv.1991, 1 ♀, vi–ix.1991 P. Hanson, Malaise trap, 400 m (LACM), Pandora, Estrella Valley, 1 ♀, 20.ii.1984, H. and A. Howden, Malaise trap (LACM); Puntarenas: Cerro Rincon, 8.52°N, 83.47°W, 2 ♀, i.1991, 1 ♀, ii.1991, 1 ♀, iii.1991, P. Hanson, Malaise trap (LACM), Coopemarti, 8.63°N, 83.47°W, ii.1991, P. Hanson, Malaise trap, 30 m (LACM), 5 km W Piedras Blancas, 8.77°N, 83.28°W, 1 ♀, vi–viii.1989, 1 ♀, iv–v.1991, 1 ♀, i.1993, P. Hanson, Malaise trap, 100 m (LACM), 10 km W Piedras Blancas, 8.75°N, 83.3°W, 2 ♀, iii–v.1989, P. Hanson, Malaise trap (LACM), 24 km W Piedras Blancas, 8.77°N, 83.4°W, 3 ♀, iii–iv.1989, P. Hanson, I. Gauld, 3 ♀, vii–ix.1990, 3 ♀, xii.1990, 1 ♀, i–iii.1991, 1 ♀, iv–v.1991, 1 ♀, i.1992, 6 ♀, ii.1992, P. Hanson, Malaise trap, 200 m (LACM, MUCR), 3 km SW Rincon, 8.68°N, 83.48°W, 2 ♀, xii.1989, 1 ♀, iii–iv.1991, P. Hanson, Malaise trap, 10 m (LACM), Rio Piro, 8.28°N, 83.32°W, 2 ♀, ii.1991, P. Hanson, Malaise trap, 75 m (LACM). GUATEMALA: Escuintla, 1 ♀, 10.viii.1965, P.J. Spangler (USNM). MEXICO: Quintana Roo: Felipe Carrillo Puerto, 1 ♀, 10–14.x.1986, [no collector], Malaise trap (EMUS), Kohunlich, 68 km W Chetumal, 1 ♀, 14–17.vii.1982, S. and J. Peck, FIT, second growth, 160 m (LACM). NICARAGUA: Rio San Juan: Re-

fugio Bartola, 16 km ESE El Castillo, 10.98°N, 84.34°W, 1 ♀, 22.iv–10.v.1999, L. LaPierre, Malaise trap (LACM). PANAMA: Canal Zone: Barro Colorado Island, 9.15°N, 79.85°W, 1 ♀, 1–7.iv.1993, J. Pickering, Malaise trap #936, 1 ♀, 23.iv–9.v.1993, J. Pickering, Malaise trap #964, 1 ♀, 16–23.iii.1994, J. Pickering, Malaise trap #2372, 1 ♀, 17–24.i.1996, J. Pickering, Malaise trap #6578 (LACM, MIUP); Darien: Cruce de Mono, 7.92°N, 77.62°W, 1 ♀, 6.ii–4.iii.1993, R. Cambra, J. Coronado, Malaise trap (MIUP); San Blas: Nusagandi Reserve, 9.33°N, 79°W, 1 ♀, 16–23.iv.1994, J. Pickering, Malaise trap #2862 (LACM). TRINIDAD: Asa Wright Nature Center, 1 ♀, 15.i.1981, G.E. Bohart (EMUS).

Apocephalus glomerosus new species

(Fig. 22)

REMARKS. This species can be recognized by the peculiar rounded dorsal sclerite of the ovipositor (Fig. 22).

DESCRIPTION. Body length 1.6–2.2 mm. Frons dark brown. Frontal ratio 1.02. Flagellomere 1 yellowish-brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae two and one-half times length and three times thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.48. Halter yellowish-brown, anteroapical half brown. Apex of hind femur without anterior or posterior dark spot. Tergite 1 light brown, medially shortened; tergite 2 brown in posterior three-fifths, light brown in anterior two-fifths, light brown medially and along posterior margin; tergites 3–4 brown, light brown anteriorly, medially, and along posterior margin; tergite 5 light brown, dark brown laterally; tergite 6 light brown in anterior half, dark brown in posterior half and laterally. Venter of abdomen yellowish-brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare, segments 4 and 5 with posterior row of thin setae. Venter of abdominal segment 5 with narrowed, lightly sclerotized sternite. Venter of abdominal segment 6 with large, square, lightly sclerotized sternite with row of thin setae across posterior third. Ovipositor expanded at midlength, narrowed posteriorly. Dorsal sclerite oval in shape, with a separate oval sclerite inset at apex. Ovipositor dorsally without large setae.

GEOGRAPHICAL DISTRIBUTION. Missouri, USA.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for rounded, referring to the shape of the dorsoapical sclerite.

HOLOTYPE. ♀, USA: Missouri: Wayne Co., Williamsville, vii.1987, J.T. Becker, Malaise trap (LACM) [LACM ENT 010992].

PARATYPE. USA: Missouri: Laclede Co., Ben-

nett Springs State Park, 1♀, 1–3.viii.1988, B.V. Brown, yellow pan traps (LACM).

Apocephalus staurotus new species

(Fig. 23)

REMARKS. This large species is easily recognized by the distinctive ovipositor with the large lateral expansions and the parallel darkenings near the apex (Fig. 23).

DESCRIPTION. Body length 3.3–4.1 mm. Frons blackish-brown. Frontal ratio 1.05. Flagellomere 1 orange-brown, elongate. Supra-antennal setae absent. Palpus light brown. Scutum light brown, brown along posterior margin. Scutellum light brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.52. Halter blackish-brown, with narrow light brown marking. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown; tergites 2–5 blackish-brown, orange-brown anteriorly, posteriorly, and medially; tergite 6 dark brown, orange-brown anteriorly, posteriorly, and medially. Venter of abdomen yellowish-brown anteriorly, grayish-brown posteriorly. Ventrolateral setae of tergite 6 slightly enlarged. Venter of abdominal segments 1–3 bare; segment 4 with row of thin setae; segment 5 with square, lightly sclerotized sternite and posterior row of long apically curved setae; segment 6 with square, lightly sclerotized sternite, and posterior row of shorter setae. Venter of ovipositor greatly expanded at midlength. Dorsum of ovipositor slightly expanded apically, with apical narrowing. Apex of ovipositor with dark lateral margins. Dorsum of ovipositor without large setae.

GEOGRAPHICAL DISTRIBUTION. Amazonian lowlands of Guyana and Peru.

DERIVATION OF SPECIFIC EPITHET. The name is from a Greek word, *staurotos*, for cruciform or cross-shaped, referring to the shape of the ovipositor.

HOLOTYPE. ♀, GUYANA: Mazaruni-Potaro: Tukeit Falls, 26–30.ix.1990, B. Hubley and L. Cootte, Malaise trap, primary rain forest, 300 ft., ROM #905019 (LACM). LACM ENT 050862].

PARATYPES. PERU: Madre de Dios: Avispas, 12.98°S, 70.35°W, 2♀, 1–15.x.1962, L. Peña, 400 m (CNCL, LACM).

Apocephalus planus new species

(Fig. 24)

REMARKS. The ovipositor of this species is similar in shape to that of *A. pergandei* Coquillett, but lacks the distinct median carina and has a dark, median spot (Fig. 24).

DESCRIPTION. Body length 1.5 mm. Frons brown. Frontal ratio 1.47. Flagellomere 1 brown apically, lighter brown basally, oval, apically pointed. Supra-antennal setae absent. Palpus yellow. Scu-

tum light brown; dark brown posteromedially. Scutellum dark brown. Anterior pair of scutellar setae one and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and three times thickness of anterior pair. Pleuron brown. Mean costal ratio 0.42. Halter light brown. Apex of hind femur without anterior or posterior dark spot. Abdominal tergites brown. Venter of abdomen gray, segment 6 dark gray. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–5 bare; segments 5 with posteriorly rounded sternite; segment 6 with posteriorly rounded sclerite and two elongate posterior setae. Ovipositor expanded at midlength, dorsally smooth, with medial darkening.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southeastern Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for smooth, referring to the dorsal surface of the ovipositor.

HOLOTYPE. ♀, BRAZIL: São Paulo: Piracicaba, ESALQ, 1–5.iv.1996, J. Pinto, pan trap (MZSP) [LACM ENT 057479].

Apocephalus coquillettii Malloch

(Fig. 25)

Apocephalus coquillettii Malloch, 1912:443, pl. 38 fig. 4. Brues, 1950:57, fig. 6G. Borgmeier, 1963:176–178, fig. 175; 1966:139.

Apocephalus pergandei: Brues, 1904:373, pl. VIII fig. 47, 48 (misidentification); 1906:9, pl. 2, fig. 10. Borgmeier, 1963:173–174 (♂, not ♀).

Apocephalus pictus Malloch, 1918:147 (♂). Synonymized by Borgmeier, 1966:139.

HOLOTYPE. ♀, USA: Tennessee: Jalapa, [no date, but stated by Malloch, 1912, to have been received 8 June 1912], P.C. Newkirk, chasing *Camponotus* (USNM; examined) [LACM ENT 037957]

REMARKS. This species is recognized by the two subapical expansions of the ovipositor (Fig. 25). Its ovipositor is most similar to that of *A. disparicauda*, but in that species it has a broader apical expansion (Fig. 26).

DESCRIPTION. Body length 1.6–2.5 mm. Frons dark brown to blackish-brown. Frontal ratio 0.99. Flagellomere 1 light brown, oval, apically pointed. Supra-antennal setae absent. Palpus light brown. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae two and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.46. Halter yellowish-brown, anteroapical half brown. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown, light brown anteriorly and posteriorly; tergite 2 dark brown, light brown anteriorly, medially, and along posterior margin; tergite 3 dark brown, light brown medially and at anterior and posterior margins (or same as tergites 4–5); ter-

gites 4–5 light brown, dark brown to blackish-brown laterally; tergite 6 dark brown to blackish-brown, light brown anteriorly. Venter of abdomen yellowish-brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare, segments 4 and 5 with posterior row of thin setae. Venter of abdominal segment 6 with large, square, lightly sclerotized sternite with row of thin setae across posterior third. Ovipositor with expansions at midlength and apex of equal size, rounded; without large setae.

GEOGRAPHICAL DISTRIBUTION. Widespread in eastern North America.

HOST. This species is a parasitoid of *Camponotus pennsylvanicus* and *C. ferrugineus* Emery, 1899. The record in Malloch (1912; via Brues, 1904 as *A. pergandei*) of a specimen from Texas with *Camponotus sansabeanus* (Buckley, 1866) refers to a specimen that I have identified as *Apocephalus similis* Malloch.

OTHER MATERIAL EXAMINED. CANADA: Ontario: Ottawa, 1♀, 21.vii.1989, J.R. Vockeroth (CNCI); Quebec: Old Chelsea, 2♀, 30.viii.1961, 1♀, 25.vi.1962, J.R. Vockeroth (CNCI). USA: Connecticut: Tolland Co., Mansfield Center, 1♀, 15–23.viii.1987, J.E. O'Donnell, Malaise trap (LACM); Iowa: Tama Co., Tama, 1♀, 13.vi.1940, A.L. Melander (USNM); Maryland: Montgomery Co., Bethesda, 1♀, 27.vii.1972, G.C. Steyskal (USNM), Colesville, 1♀, 18.ix.1977, W.W. Wirth, Malaise (USNM), Plummer's Island, 1♀, 17.vii.1921, H.S. Barber, "hovering a half inch over *Camponotus*" (USNM), 2♀, 8.vii.1968, P.J. Spangler, Malaise trap (USNM); Missouri: Laclede Co., Bennett Springs State Park, 1♀, 1–2.viii.1984, pan traps, 3♀, 7–8.viii.1988, over *Camponotus pennsylvanicus*, B.V. Brown (LACM); New Hampshire: Hillsboro Co., Nashua, 42.76°N, 71.47°W, 1♀, 20–22.vii.1994, S. Gaimari, Malaise trap, 50 m (LACM), Rockingham Co., 1.6 km SW Durham, 21.viii–2.ix.1987, D.S. Chandler, FIT (DENH), Nottingham, 1♀, 18.viii.1969, [no collector name], "presumably attacking carpenter ants" (DENH), Strafford Co., Durham, 1♀, 27.viii.1954, W.J. Morse (DENH), 4 mi. W Durham, 1♀, 9–13.ix.1982, 1♀, 5–12.x.1982, R.M. Reeves, Malaise trap (DENH); New Jersey: Warren Co., Delaware Water Gap, 1♀, [no date], A.T. Slosson (AMNH); New York: Ulster Co., Cherrytown, 4 mi. NNW Kerhonkson, 1♀, 15–30.vi.1971, 3♀, 8–18.viii.1971, 4♀, 19.viii–12.ix.1971, P. and B. Wygodzinsky (AMNH), Washington Co., Cambridge Fen, 43°2.30'N, 73°25.00'W, 1♀, 15.viii.1989, 2♀, 23.viii.1989, H. Romack, 244 m (NYSM), Camden Valley, 43°8.52'N, 73°15.52'W, 1♀, 3.viii.1989, H. Romack, 244 m (NYSM), Eldridge Swamp, 43°33.34'N, 73°21.27'W, 1♀, 26.vii–2.viii.1988, 1♀, 9–16.viii.1988, J.K. Barnes (NYSM), [county?]: Bear Mountain, 1♀, 10.viii.1947, C.H. Curran (AMNH); North Carolina: Swain Co., Cherokee, 1♀, 29.v.1957, J.R. Vockeroth, 2000 ft. (CNCI); Pennsylvania: Phila-

delphia Co., Frankford, 1PT♀, "01-2", C.W. Johnson [point-mounted specimen of *Camponotus ferrugineus* on same pin] (MCZC); Texas: Brazoria Co., 4 mi. SW Columbia, 1♀, 24.vii.1975, D.H. Feener, over *Camponotus pennsylvanicus* (LACM). West Virginia: Hardy Co., Lost River State Park, 1♀, 10.vii.1977, W.W. Wirth, Malaise trap (USNM).

Apocephalus disparicauda Borgmeier
(Fig. 26)

Apocephalus disparicauda Borgmeier, 1962:79, fig. 12; 1963:178, fig. 179.

HOLOTYPE. ♀, USA: Virginia: Fairfax Co., Dead Run, 5.x.1912, J.R. Malloch (USNM; examined) [LACM ENT 055527].

REMARKS. The ovipositor of this species is most similar to that of *A. coquillettii* Malloch, but in *A. disparicauda*, it has an apical expansion that is broader than the expansion at midlength (Fig. 26).

DESCRIPTION. Body length 1.9–2.0 mm. Frons dark brown. Frontal ratio 1.03. Flagellomere 1 yellowish-brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae one and one-half times length and twice thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.48. Halter light brown, brown anteroapically. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown, slightly lighter medially, light brown along posterior margin; tergite 2 light brown in anterior two-fifths, blackish-brown in posterior three-fifths, light brown medially and along posterior margin; tergites 3–5 blackish-brown, light brown anteriorly, medially, and along posterior margin; tergite 6 blackish-brown, light brown anteriorly. Venter of abdomen yellowish-brown, segment 6 brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare, segments 4 and 5 with posterior row of thin setae. Venter of abdominal segment 6 with large, square, lightly sclerotized sternite with row of thin setae across posterior third. Ovipositor with expansions at midlength and apex; apical expansion enlarged by flat, rounded extensions. Ovipositor without large, dorsal setae.

GEOGRAPHICAL DISTRIBUTION. North-eastern USA.

OTHER MATERIAL EXAMINED. USA: Minnesota: Blue Earth Co., [no locality other than "NE Blue Earth Co."], 1♀, "7-6-64," J.L. Karthan (USNM); New York: Washington Co., Camden Valley, 43.13°N, 73.25°W, 1♀, 29.viii.1989, H. Romack, 244 m (NYSM).

Apocephalus camponoti Borgmeier

(Figs. 27, 28)

Apocephalus camponoti Borgmeier, 1925:196–197, fig. 26, pl. 16 fig. 66.**TYPES.** 63♀, BRAZIL: Parana: Rio Negro, 24.i.1924, T. Borgmeier (3♀ examined; MCZC, USNM).**REMARKS.** The ovipositor of this species is extremely distinctive with its down-turned shape and strongly recurved ventral apex (Figs. 27, 28).**DESCRIPTION.** Body length 1.8–1.9 mm. Frons blackish-brown. Frontal ratio 1.05. Flagellomere 1 yellow, oval. Supra-antennal setae absent. Palpus yellow. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae slightly thicker and longer than posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.46. Halter yellowish-brown, brown anteroapically. Apex of hind femur without anterior or posterior dark spot. Tergite 1 dark brown, lighter medially; tergite 2 dark brown, light brown anteriorly, medially, and along posterior margin; tergites 3–5 dark brown, narrowly light brown along posterior margin (tergite 3 sometimes light brown medially); tergite 6 light brown anteriorly, dark brown posteriorly. Venter of abdomen yellowish-brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare, segments 4 and 5 with posterior row of thin setae. Venter of abdominal segment 6 with large, square, lightly sclerotized sternite with row of thin setae across posterior third. Ovipositor down-turned, narrowed posteriorly, apically truncate. Ventral apex reflected anterodorsally. Dorsum of ovipositor with two large subapical setae. Venter with two lateral setae on each side.**GEOGRAPHICAL DISTRIBUTION.** Known from a single site in southeastern Brazil.**HOST.** All specimens were collected as they attacked workers of the ant *Camponotus rufipes* (Fabricius, 1775) at the nest entrance (Borgmeier, 1925).*Apocephalus crucicauda* Borgmeier

(Fig. 29)

Apocephalus crucicauda Borgmeier, 1928:171–172, pl. 27 fig. 5.**TYPES.** BRAZIL: Paraná: Rio Negro, 2♀, 11.v.1925, M. Witte, with *Camponotus* sp. (MZSP; examined). The specimens are stored in alcohol.**REMARKS.** This species is recognized by the shape of the ovipositor, especially its extremely narrow posterior section (Fig. 29).**DESCRIPTION.** Body length 1.6–1.7 mm. Frons dark brown. Frontal ratio 1.29. Flagellomere 1 yellowish-brown, oval. Supra-antennal setae absent. Palpus yellow. Scutum and scutellum light brown. Anterior pair of scutellar setae about twice as long and thick as posterior setae of scutum. Posterior

pair of scutellar setae slightly longer and thicker than anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.47 wing length. Halter brown. Apex of hind femur without anterior or posterior dark spot. Tergites yellow with dark markings that increase in size in posterior segments. Venter of abdomen yellowish-brown; segment 6 dark brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–4 bare. Venter of segment 5 with round, lightly sclerotized sternite and row of thin setae. Venter of abdominal segment 6 with large, round, lightly sclerotized sternite and one lateral seta; apical margin with series of short peglike setae with long thin apices. Ovipositor greatly expanded at midlength, abruptly narrowed, posteriorly thin; without large setae.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southeastern Brazil.**HOST.** Collected “with” (presumably attacking or hovering over) *Camponotus crassus* Mayr, 1862.**OTHER MATERIAL EXAMINED.** BRAZIL: Paraná: Rio Negro, 2♀, 7.v.1925, [no collector name], with *Camponotus crassus* (MZSP).*Apocephalus reburrus* new species

(Figs. 18, 30)

REMARKS. This species is extremely distinctive with the long, dense ventral setae of the abdomen (Fig. 18) and the short, peglike setae on the posteroventral surface of the hind femur.**DESCRIPTION.** Body length 1.9–2.3 mm. Frons brown. Frontal ratio 1.3. Flagellomere 1 light brown, oval. One pair of distinct, but small, supra-antennal setae present. Palpus yellow. Scutum yellowish-brown. Scutellum yellowish-brown. Anterior pair of scutellar setae two and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and thickness of anterior pair. Pleuron yellow. Mean costal ratio 0.49. Halter dark brown. Apex of hind femur without anterior or posterior dark spot; venter of femur with row of dense, short, peglike setae. Abdominal tergites yellow, darker laterally. Venter of abdomen yellow. Ventrolateral setae of tergites 5–6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare, segments 4–6 with long, thin ventral setae and large sternites (Fig. 18). Ovipositor broadest at midlength, with median and lateral carinae (Fig. 30). Venter of ovipositor curves dorsally at midlength, with pair of large, lateral setae. Ventral apex of ovipositor broadly truncate, with posterior apices pointed.**GEOGRAPHICAL DISTRIBUTION.** Northern Colombia and Venezuela.**DERIVATION OF SPECIFIC EPITHET.** The name is Latin for hairy, referring to the setose venter of the abdomen.**HOLOTYPE.** ♀, VENEZUELA: Zulia, 20–23.iv.1981, H. Townes and L. Masner, Malaise trap, rainforest, 200 m (LACM) [LACM ENT 010820].

PARATYPES. COLOMBIA: Magdalena: PNN Tayrona, Zaino, 11.33°N, 74.03°W, 4♀, 28.vi–17.vii.2000, 1♀, 17–28.vii.2000, R. Henriquez, Malaise trap CAP-301, CAP-299 (LACM, UNCB). VENEZUELA: 3♀, same data as holotype (CNCI, LACM).

Apocephalus pergandei-subseries

DIAGNOSIS. Ovipositor with well-developed, dorsomedial, bicarinate ridge.

Apocephalus aequalis new species

(Fig. 31)

REMARKS. The ovipositor of this species has slight expansions, both at midlength (where the expansion is larger) and apex (Fig. 31). Unlike many *A. pergandei*-subseries species, the apical region of the ovipositor is not strongly narrowed, giving the tip of the ovipositor a truncate, blunt appearance.

DESCRIPTION. Body length 2.0–2.7 mm. Frons dark brown. Frontal ratio 1.42. Flagellomere 1 light brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown; dark brown posteromedially. Scutellum dark brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.55. Halter blackish-brown, with narrow yellow marking. Apex of hind femur with small, brown anterior and posterior dark spots. Tergites dark brown; tergites 1–4 light brown anteriorly, medially, and along posterior margin; tergite 5 light brown anteriorly and along posterior margin; tergite 6 light brown along posterior margin. Venter of abdomen yellowish-brown; fifth segment light brown, segment 6 dark brown. Ventrolateral setae of tergites 5–6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare; segment 4 with scattered thin setae; segment 5 with narrow, slightly sclerotized sternite and short, thin posterior setae; segment 6 with round, slightly sclerotized sternite and short, thin posterior setae. Ovipositor slightly expanded at midlength, posteriorly parallel-sided. Ovipositor dorsally with one pair of long setae at apical one-third.

GEOGRAPHICAL DISTRIBUTION. Costa Rica and Panama.

DERIVATION OF SPECIFIC EPITHET. The name is a Latin word for uniform, referring to the relatively unchanged breadth of the ovipositor throughout its length.

HOLOTYPE. ♀, PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 27.iv–4.v.1994, J. Pickering, Malaise trap #2422 (LACM) [LACM ENT 137316].

PARATYPES. COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 2♀, 3.iv.2000, ALAS, Malaise trap M/19/745 (INBC, LACM); Limón: 7 km SW Bribri, 9.58°N, 82.88°W, 1♀, ix–xi.1989, P. Hanson, Malaise trap (LACM).

PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 12♀, 1–7.iv.1993, J. Pickering, Malaise trap #936, 1♀, 12–19.v.1993, J. Pickering, Malaise trap #942, 1♀, 27.iv–4.v.1994, J. Pickering, Malaise trap #2422 (LACM, MCZC, MIUP, NHRS, USNM).

Apocephalus astrictus new species

(Fig. 32)

REMARKS. There are three species in the *A. pergandei*-subseries with relatively narrow, posteriorly tapering ovipositors: *A. astrictus*, *A. cuneatus* Borgmeier, and *A. similis*. The ovipositor of *A. similis* has the dorsolateral process of the ventral sclerite of the ovipositor undeveloped (as in *A. pergandei* in Fig. 42A), so that the lateral margins of the ovipositor are relatively inconspicuous, whereas in the other two species, the lateral margin is prominent and almost black in color. In *A. astrictus* the dorsolateral process is moderately developed (as in *A. bulbosus* new species in Fig. 42C), and in *A. cuneatus* it is well developed (Fig. 42B). In *A. cuneatus*, the process has a thickening at midpoint that imparts a slight bulge to the lateral margin in dorsal view (Fig. 35), whereas the lateral margin in *A. astrictus* and *A. similis* is straight.

DESCRIPTION. Body length 1.7 mm. Frons dark brown. Frontal ratio 1.25. Flagellomere 1 light brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum brown. Scutellum dark brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae slightly greater in length and twice thickness of anterior pair. Pleuron light brown. Mean costal ratio 0.46. Halter light brown, dark brown anteriorly. Apex of hind femur without anterior or posterior dark spot. Tergites dark brown; tergites 1–2 light brown anteriorly, medially, and along posterior margin; tergites 3–4 light brown posteriorly and medially; tergites 5–6 light brown posteriorly. Venter of abdomen light brown. Ventrolateral setae of tergites 5–6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare; segment 4 with scattered thin setae; segment 5 with narrow, slightly sclerotized sternite, and short, thin posterior setae; segment 6 with round, slightly sclerotized sternite and short, thin posterior setae. Ovipositor slender, slightly expanded at midlength, narrowing posteriorly. Ovipositor dorsally with one pair of long setae at apical one-third.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southern Mexico.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for narrow, referring to the shape of the ovipositor.

HOLOTYPE. ♀, MEXICO: Chiapas: Yaxoquintela, 16.97°N, 91.78°W, 1–10.x.1978, J.E. Rawlins, 560 m (CMNH) [LACM ENT 050889].

Apocephalus bispinosus Borgmeier

(Fig. 33)

Apocephalus bispinosus Borgmeier, 1928:170–171, pl. 27 fig. 4, pl. 33 fig. 40.

TYPES. BRAZIL: Goiás: Campinas, 1♂, 2♀, vi.1928, J.S. Schwarzmaier, with *Camponotus cingulatus* (ovipositor of one female on a microscope slide examined; MZSP).

REMARKS. There are two similar species of the *A. pergandei*-subseries that have greatly expanded lateral margins: *A. bispinosus* (Fig. 33) and *A. sharkeyi* new species (Fig. 41). In *A. bispinosus* there are a pair of apical, divergent sclerites that are lacking in *A. sharkeyi*. Furthermore, in *A. bispinosus* the lateral expansion encircles a rounded, clear, membranous area, whereas in *A. sharkeyi* the membranous area is narrow and linear.

DESCRIPTION. Body length 1.8–2.5 mm. Frons dark brown. Frontal ratio 1.31. Flagellomere 1 orange-brown, oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.49. Halter dark brown, with narrow yellow marking. Apex of hind femur without anterior or posterior dark spot. Tergite 1 dark brown, lighter medially; tergite 2 dark brown, light brown anteriorly, medially, and along posterior margin; tergites 3–5 dark brown, narrowly light brown along posterior margin (tergite 3 sometimes light brown medially); tergite 6 light brown anteriorly, dark brown posteriorly. Venter of abdomen yellowish-brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–4 bare. Venter of segment 5 with round, narrow, lightly sclerotized sternite and row of thin setae. Venter of abdominal segment 6 with large, round, lightly sclerotized sternite and one lateral seta; apical margin with series of short peglike setae with long thin apices. Venter of ovipositor abruptly expanded at midlength, roundly expanded at apex.

GEOGRAPHICAL DISTRIBUTION. Southeastern Brazil.

HOST. The types were collected over a nest of *Camponotus cingulatus* Mayr, 1862.

OTHER MATERIAL EXAMINED. BRAZIL: Minas Gerais: Aguas Vermelhas, 2♀, xii.1983, M. Alvarenga (CMNH, LACM); São Paulo: Itatinga, 1♀, 9.ii.1947, J. Lane (MZSP).

Apocephalus bulbosus new species

(Figs. 34, 42C)

REMARKS. This species can be recognized by the relatively narrow ovipositor with an expansion posterior to midlength (Fig. 34).

DESCRIPTION. Body length 2.0–2.5 mm. Frons dark brown. Frontal ratio 1.33. Flagellomere 1

light brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum yellowish-brown anterolaterally, brown medially, dark brown posteriorly. Scutellum dark brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.49. Halter dark brown, with narrow yellow marking. Apex of hind femur with small, brown anterior and posterior dark spots. Tergites dark brown; tergites 1–5 brown anteriorly, medially, and along posterior margin; tergite 6 slightly lighter along anterior margin. Venter of abdomen yellowish-brown; darkening posteriorly, fifth segment medially dark brown. Ventrolateral setae of tergites 5–6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare; segment 4 with scattered thin setae; segment 5 with narrow, slightly sclerotized sternite and scattered, thin setae; segment 6 with round, slightly sclerotized sternite, and short, thin posterior setae. Ovipositor slightly expanded below midlength, narrowed apically. Ovipositor dorsally with one pair of long setae at apical one-third.

GEOGRAPHICAL DISTRIBUTION. Costa Rica and Ecuador.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for swollen, referring to the swelling below midlength of the ovipositor.

HOLOTYPE. ♀, ECUADOR: Sucumbios: Sacha Lodge, 0.5°S, 76.5°W, 30.ix–10.x.1994. P. Hibbs, Malaise trap, 270 m (LACM) [LACM ENT 049961].

PARATYPES. COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1♀, 2.v.1993, ALAS, Malaise trap M/01/80 (INBC). ECUADOR: 1♀, same data as holotype (QCAZ).

Apocephalus cuneatus Borgmeier

(Figs. 35, 42B)

Apocephalus cuneatus Borgmeier, 1958:349–350, figs. 42, 51.

TYPES. According to Borgmeier (1958), 2♀, BRAZIL: Santa Catarina: Nova Teutônia, F. Plauermann (not examined; MZSP). One specimen from Brazil in the collection of the MCZC (see “Other Material Examined”) is labeled as “♀ type” but it seems unlikely that Borgmeier would have sent one of the only two specimens to the United States. Likely he labeled this as a type some time after the original description of the species.

REMARKS. This species differs from those with a similar ovipositor, *A. strictus* and *A. similis* as discussed under *A. strictus*, above.

The other species with a similar ovipositor is *A. opimus* new species, which shares the lateral bulge in dorsal view (Fig. 37); however, the ovipositor of *A. cuneatus* is narrower and much more tapered posteriorly (Fig. 35).

DESCRIPTION. Body length 2.3–3.0 mm. Frons blackish-brown. Frontal ratio 1.41. Flagellomere 1

yellow becoming dark brown at apex; oval. Supra-antennal setae absent. Palpus yellow. Scutum light brown, dark brown posteromedially. Scutellum dark brown. Anterior scutellar setae slightly longer and thicker than posterior setae of scutum. Posterior pair of scutellar setae twice as long and thick as anterior pair. Pleuron whitish-yellow. Mean costal ratio 0.47 wing length. Halter yellow with apical two-thirds black. Apex of hind femur without anterior or posterior dark spot. Tergite 1 dark brown, medially incomplete; tergites 2–5 dark brown with yellow anterior and posterior margins and yellow median strip; tergite 6 dark brown. Venter of abdomen yellow, segment 6 dark gray. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–4 bare. Venter of segment 5 with round, lightly sclerotized sternite and row of thin setae. Venter of abdominal segment 6 with large, round, lightly sclerotized sternite and one lateral seta; apical margin with series of short peglike setae with long thin apices. Ovipositor slightly expanded at midlength, with slight second expansion at posterior one-third. In lateral view, dorsolateral expansion of ventral sclerite thickened at posterior one-third and apex. Ovipositor dorsally with one pair of medium-sized setae in posterior one-third.

GEOGRAPHICAL DISTRIBUTION. Southeastern Brazil to Costa Rica.

OTHER MATERIAL EXAMINED. BRAZIL: Santa Catarina: Nova Teutônia, 1♀, F. Plaumann (MCZC). COSTA RICA: Guanacaste: La Taboga For. Res., 9 km SW Cañas, 1♀, 24–28.iii.1987, W.L. Rubink, Malaise trap (EMUS), Santa Rosa National Park, 3♀, 27.viii–18.ix.1986, I. Gauld, D. Janzen, Malaise trap, 300 m, SE-8-C (INBC, LACM, MUCR), 3♀, 21.ii–14.iii.1987, I. Gauld, D. Janzen, Malaise trap, 300 m, BH-9-O (LACM), 1♀, 14.iii–4.iv.1987, I. Gauld, D. Janzen, Malaise trap, H-4-C (LACM); Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1♀, 1.iv.1993, ALAS, Malaise trap M/02/49, 1♀, 15.vii.1993, ALAS, Malaise trap M/04/155, 1♀, 3.viii.1993, ALAS, Malaise trap M/04/167, 8♀, 3.iv.2000, ALAS, Malaise trap M/19/745 (INBC, LACM, NHRS, USNM); San José: Escazu, 1♀, 19–24.iv.1988, F.D. Parker (EMUS).

Apocephalus fernandesi new species (Fig. 36)

REMARKS. The ovipositor of this species is like a broader version of *A. astrictus*, but *A. fernandesi* also has a pair of lateral dark markings at the apex of the ovipositor (Fig. 36; visible in cleared specimens only) which are not found in other *A. pergandei*-subseries species.

DESCRIPTION. Body length 2.2–2.3 mm. Frons dark brown. Frontal ratio 1.35. Flagellomere 1 light brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown anteriorly, darker posteriorly. Scutellum dark brown. An-

terior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.49. Halter blackish-brown, with narrow yellow marking. Apex of hind femur with small, brown anterior and posterior dark spots. Tergite 1 dark brown, yellowish-brown anteriorly, posteriorly and medially; tergites 2–5 blackish-brown, light brown anteriorly, medially, and along posterior margin; tergite 6 blackish-brown, light brown along posterior margin. Ventrolateral setae of tergites 5–6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare; segment 4 with scattered thin setae; segment 5 with narrow, slightly sclerotized sternite, and short, thin posterior setae; segment 6 with round, slightly sclerotized sternite and short, thin posterior setae. Ovipositor expanded from midlength to apical one-third. Dorsum of ovipositor with lateral darkenings at apex (visible only in cleared specimens). Ovipositor dorsally with one pair of long setae at apical one-third.

GEOGRAPHICAL DISTRIBUTION. Amazonian Colombia.

DERIVATION OF SPECIFIC EPITHET. This species is named for Fernando Fernandez, who aided and hosted our research in Colombia.

HOLOTYPE. ♀, COLOMBIA: Amazonas: 22 km NW Leticia, 4.04°S, 69.99°W, 4–7.ix.1997, M. Sharkey, Malaise trap in treefall gap (UNCB) [LACM ENT 099916].

PARATYPE. ♀, COLOMBIA: Amazonas: PNN Amacayacu, Mocagua, 3.82°S, 70.26°W, 14–21.viii.2000, A. Parente, Malaise trap, CAP-853 (LACM).

Apocephalus opimus new species (Fig. 37)

REMARKS. The ovipositor of this species is most similar in shape to that of *A. cuneatus* but is broader and not as tapered posteriorly (Fig. 37).

DESCRIPTION. Body length 2.2–2.5 mm. Frons dark brown. Frontal ratio 1.35. Flagellomere 1 yellowish-brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum yellowish-brown anterolaterally, brown medially, dark brown posteriorly. Scutellum dark brown. Anterior pair of scutellar setae one and one-half times length and twice thickness of posterior setae of scutum. Posterior pair of scutellar setae slightly greater in length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.48. Halter brown, with narrow yellow marking. Apex of hind femur without anterior or posterior dark spot. Tergites dark brown, with tergites 1–5 yellowish-brown medially; tergite 2 anteriorly and posteriorly; tergites 3–4 yellowish-brown posteriorly; tergite 5 with posterior third yellowish-brown; tergite 6 with lightened posterior margin. Venter of abdomen yellowish-brown, segment 6 brown. Vento-

lateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–4 bare. Venter of segment 5 with round, lightly sclerotized sternite and row of thin setae. Venter of abdominal segment 6 with large, round, lightly sclerotized sternite and one lateral seta; apical margin with series of short peglike setae with long thin apices. Ovipositor expanded in middle three-fifths, with slight second expansion at posterior one-third. In lateral view, dorsolateral expansion of ventral sclerite thickened at posterior one-third and apex. Ovipositor dorsally with bicarinate median ridge and one pair of medium-sized setae in posterior one-third.

GEOGRAPHICAL DISTRIBUTION. Osa Peninsula in southern Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for fat, referring to the broad ovipositor.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: 24 km W Piedras Blancas, 8.77°N, 83.4°W, i.1992, P. Hanson, Malaise trap, 200 m (LACM) [LACM ENT 049115].

PARATYPES. COSTA RICA: Puntarenas: Coopemarti, 8.63°N, 83.47°W, 1 ♀, ii.1991, P. Hanson, Malaise trap, 30 m (INBC), 5 km W Piedras Blancas, 8.77°N, 83.28°W, 1 ♀, x.1991, P. Hanson, Malaise trap, 100 m (LACM).

Apocephalus pergandei Coquillett
(Plate 1; Figs. 38, 39, 42A)

Apocephalus pergandei Coquillett, 1901:501, fig. 21. Malloch, 1912:443–444, pl. 38 figs. 3, 6, 10, pl. 41 fig. 6. Brues, 1950:57–59, fig. 6F. Borgmeier, 1963:172–174, fig. 169 (♀, not ♂ = *A. coquilletti*).

Apocephalus similis Borgmeier, 1963:175–176 (in part, specimens from USA: Washington: Lake Chelan, Lucerne) (not Malloch).

HOLOTYPE. ♀, USA: Maryland: Montgomery Co., Cabin John Bridge, 24.ix.1900, T. Pergande (examined; USNM) [USNM Type #5201].

REMARKS. The limits of this species are questionable because of variation in ovipositor size. Frequently, it has been compared with a species found in the southwestern United States, *A. similis*. Borgmeier (1963:163), in his key to North American *Apocephalus* species, separated the two with the couplet “Ovipositor anteriorly more than twice as broad as behind (*A. pergandei*)” versus “Ovipositor anteriorly less than twice as broad as behind (*A. similis*).” In the northern and western parts of the continent, however, are specimens that have a relatively broader posterior section of the ovipositor (an extreme example is shown in Fig. 39) that this couplet identifies as *A. similis* (as did Borgmeier with a pair of specimens from Washington State). Clearly, however, they are not conspecific with the southwestern species, and I considered these problem specimens a potential third species.

In an attempt to separate phenetic groups within the North American populations of *A. pergandei*

and *A. similis*, I plotted (Fig. 3) the maximum basal width of the ovipositor (upper width) versus the width at the apex (lower width). These measurements correspond to Borgmeier’s key characters of ovipositor breadth anteriorly and “behind.”

Specimens of *A. similis* immediately separate from the rest based on their small upper width (triangles in Fig. 3). Their host, *Camponotus sansabeanus*, is also restricted to the southwestern United States (Creighton, 1950) and *A. similis* is here considered a separate species (treated below).

Specimens of *A. pergandei* (Fig. 3, diamonds) and the potential third species (squares) are less differentiated, however. Using this relatively simple analysis, I could not reliably separate the two taxa into discrete groups. There is an area of overlap in lower width between 0.15 and 0.16 mm where specimens of both species occur. Above this area of overlap are most of the potential third species; below are typical *A. pergandei*.

The host of *A. pergandei* is *Camponotus pennsylvanicus*, a species that occurs only within the range of typical *A. pergandei* specimens (Creighton, 1950). The potential third species ranges from southern Canada and the west coast of the United States north to tree line in Alaska and northern Canada, a distribution that coincides with that of related species *C. herculeanus* (Linnaeus, 1758) in the north and *C. modoc* Wheeler, 1910, in the west (Creighton, 1950); however, no host records exist for these species.

In summary, it is possible that the potential third species is a separate species with a broader ovipositor apex that parasitizes *Camponotus herculeanus*, but there is not enough evidence to come to this conclusion at this time. Perhaps life history or molecular studies could resolve this question, but for now I consider them to be part of a single variable species named *A. pergandei*.

DESCRIPTION. Body length 1.5–2.6 mm. Frons dark brown. Frontal ratio 0.94. Flagellomere 1 yellowish-brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown to brown. Scutellum light brown to brown. Anterior pair of scutellar setae one and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.47. Halter yellowish-brown, anteroapical half brown. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown, light brown anteriorly and posteriorly; tergite 2–4 light brown, blackish-brown laterally, with or without dark brown posteriorly; tergite 5 light brown, blackish-brown laterally; tergite 6 blackish-brown, light brown anteriorly. Venter of abdomen yellowish-brown; grayish-brown laterally. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare, segments 4 and 5 with posterior row of thin setae. Venter of abdominal segment 5 with narrowed, lightly sclerotized sternite. Venter of ab-

dominal segment 6 with large, square, lightly sclerotized sternite with row of thin setae across posterior third. Ovipositor greatly expanded at midlength, narrowed posteriorly, lateral margins roughly parallel (Fig. 38); northern and western specimens with apical portion of ovipositor less narrowed (Fig. 39). Ovipositor dorsally with one pair of long setae at apical one-third.

GEOGRAPHICAL DISTRIBUTION. Widespread in North America.

HOST. The only confirmed host is *Camponotus pennsylvanicus*; however, other hosts must be used (see "REMARKS").

OTHER MATERIAL EXAMINED. CANADA: Alberta: 77 km S Fort Vermilion, 57.90°N, 115.40°W, 1♀, 22.v–25.vi.1991, 3♀, 25.vi–14.viii.1991, E. Fuller, Malaise trap (LACM), Opal, 53.98°N, 113.22°W, 1♀, 20–22.vii.1986, B.V. Brown, Malaise trap, sand, jackpine (LACM), 81 km N Red Earth, Tall Cree Crossing, 57.23°N, 115.27°W, 14♀, 25.vi–14.viii.1991, E. Fuller, Malaise trap (LACM), Rock Island Lake, 55.50°N, 113.38°W, 8♀, 26.vi–16.viii.1991, E. Fuller, Malaise trap (LACM), Wagner Natural Area, 8 km W Edmonton, 1♀, 26.vii–8.viii.1990, B.V. Brown, Malaise trap (LACM); British Columbia: north shore of Lake Shuswap, 50.98°N, 119.10°W, 1♀, 23–31.viii.1987, J.E. O'Hara, Malaise trap, Columbian forest, 400 m (LACM); Manitoba: Winnipeg, St. Charles Rifle Range, 1♀, 8–15.viii.1997, D.A. Pollock, Malaise trap, prairie/aspen (LACM); Ontario: Guelph, South Arboretum, 1♀, 27.viii–4.ix.1985, B.V. Brown, Malaise trap, deciduous forest (LACM), Innisville, 6.viii.1963, W.R.M. Mason (CNCI), Timagami, 1♀, 4.ix.1932, A.W.A. Brown (AMNH). USA: Alabama: Dekalb Co., Desoto State Park, 1♀, 17.v.1988, E. Fuller, over *Camponotus pennsylvanicus* (LACM); Alaska: Fairbanks, mi. 50 Chena Hot Springs Road, 3♀, 28.vii–12.viii.1984, S. and J. Peck, Malaise pans (LACM); California: Sierra Co., SFSU Field Station, 10 km W Yuba Pass, 4♀, 28.vii–10.viii.1996, N. Schiff, Malaise trap (LACM); District of Columbia: Washington, 1♀, 4.v.1902, [reared] from *Camponotus pennsylvanicus*, 1♀, 21.viii.1902, 1♀, 29.viii.1902, trying to lay eggs on *Camponotus pennsylvanicus*, T. Pergande (USNM); Georgia: Clarke Co., 33.90°N, 83.27°W, 1♀, 15–22.vii.1992, J. Pickering, Malaise trap #143 (LACM); Maryland: Montgomery Co., Cabin John Bridge, 1♀, 21.ix.1900, reared from *Camponotus pennsylvanicus*, 1♀, 24.ix.1900, over colony of *Camponotus pennsylvanicus*, T. Pergande (USNM), Colesville, 1♀, 13.viii.1977, 7♀, 18.ix.1977, W.W. Wirth, Malaise trap (USNM), Plummer's Island, 1♀, 16.x.1913, R.C. Shannon (USNM), Prince Georges Co., 39.05°N, 76.78°W, 1♀, 31.vii–1.viii.1992, J. Pickering, Malaise trap #228 (LACM); Missouri: Boone Co., Columbia, 1♀, 8.x.1977, E.G. Riley (UMRM), Laclede Co., 5♀, 7–8.vii.1988, B.V. Brown, over *Camponotus pennsylvanicus* (LACM), Wayne Co., Williamsville, 2♀,

16.vii–8.viii.1988, J.T. Becker, Malaise trap (LACM); New Jersey: Burlington Co., Mt. Misery, 39.92°N, 74.52°W, 2♀, 13–25.ix.1992, J. Gelhaus, Malaise trap (LACM); New York: Greene Co., near Platte Clove, 42.15°N, 74.12°W, 2♀, 5–12.vii.1988, 1♀, 26.vii–2.viii.1988, 1♀, 2–9.viii.1988, 1♀, 9–30.viii.1988, J.K. Barnes (NYSM), Ulster Co., Cherrytown, 4 mi. NNW Kerhonkson, 1♀, 15–30.vi.1971, P. and B. Wygodzinski (AMNH), Washington Co., Eldridge Swamp, 43.05°N, 73.35°W, 1♀, 22–30.vii.1985, 1♀, 6.viii–4.ix.1986, 1♀, 28.vi–5.vii.1988, 1♀, 5–12.vii.1988, 1♀, 14–28.vii.1988, 1♀, 2–9.viii.1988, 2♀, 9–16.viii.1988, J.K. Barnes (NYSM); North Carolina: Graham Co., Robbinsville, 1♀, 9.vi.1976, G.E. Bohart (EMUS); Oregon: Baker Co., Lower Goose Creek, 36 mi. SE Union, 2♀, 13–19.vii.1975, 1♀, 24–31.viii.1975, E.J. Davis, Malaise trap baited with CO₂ (WSUC), Clackamas Co., Eagle Creek, 1♀, 2.viii.1921, A.L. Melander (USNM), Hood River Co., Mt. Hood, 1♀, 29.vii.1921, A.L. Melander (USNM); Utah: Cache Co., Tony Grove Canyon, 1♀, 14–20.viii.1967, W.J. Hanson (EMUS); Virginia: Fairfax Co., Huntley Meadows Park, 1♀, 31.vii.1991, B.V. Brown, over *Camponotus* (LACM), 5♀, 9–21.viii.1991 (LACM, NHRS), 4♀, 4–28.ix.1991, 2♀, 5–20.x.1991, B.V. Brown, Malaise trap (LACM), Springfield, 1♀, 1–7.v.1991, 1♀, 1–15.ix.1991, Malaise trap, G.W. Courtney (LACM); Washington: Chelan Co., Lucerne, 1♀, 29.vii.1919, A.L. Melander (USNM), 13 km SW Leavenworth, 8-Mile Campground, 1♀, 28–29.vi.1987, B.V. Brown, Malaise trap (LACM); West Virginia: Great Cacapon to Largent, 1♀, 2–3.vii.1977, W.W. Wirth, Malaise trap (USNM); Wisconsin: Cranmoor, 1♀, 12.vi.1910, C.W. Hooker (USNM).

Apocephalus rugosus new species

(Fig. 40)

REMARKS. This species can be recognized by the distinctive shape of the ovipositor (Fig. 40) and the ovipositor's wrinklelike sculpturing on the dorsal surface at midlength.

DESCRIPTION. Body length 1.91 mm. Frons dark brown. Frontal ratio 0.88. Flagellomere 1 yellowish-brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae four times length and three times thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.43. Halter yellowish-brown, slightly darker apically. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown, light brown anteriorly, posteriorly, and medially; tergites 2–5 dark brown; light brown anteriorly, posteriorly, and medially; tergite 6 dark brown, light brown anteriorly. Venter of abdomen yellowish-brown; grayish-brown laterally, segment 6 dark brown. Ventrolateral setae of tergites 5–6 greatly enlarged, bristlelike. Venter of abdominal

segments 1–3 bare; segment 4 with row of short, thin setae; segment 5 with narrow, lightly sclerotized sternite and row of short, thin setae; segment 6 with square, lightly sclerotized sternite and posterior row of short, thin setae. Ovipositor with rounded lateral expansion at midlength; dorsum of ovipositor with expansion at apical one-third, narrowed posteriorly. Dorsal surface with fine wrinklelike markings, without long setae.

GEOGRAPHICAL DISTRIBUTION. Known from single sites in Ontario and Missouri.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for wrinkled, referring to the sculpturing on the dorsum of the ovipositor.

HOLOTYPE. ♀, CANADA: Ontario: Foote's Bay, shore of Lake Joseph, 45.13°N, 75.79°W, 11–30.viii.1985, B.V. Brown, Malaise trap, second growth deciduous forest (LACM) [LACM ENT 095427].

PARATYPES. USA: Missouri: Boone Co., "Silver Fork St. St.," 1♀, 4.x.1975, R.W. Shepard (UMRM).

Apocephalus sharkeyi new species
(Fig. 41)

REMARKS. The ovipositor of this species is similar to that of *A. bispinosus* (Fig. 33) but lacks the divergent apical sclerites found in that species. It also has narrow membranous openings laterally on the ovipositor (Fig. 41), versus the broad, rounded openings found in *A. bispinosus*.

DESCRIPTION. Body length 2.65–2.9 mm. Frons dark brown. Frontal ratio 1.2. Flagellomere 1 brown, oval. Supra-antennal setae absent. Palpus light brown. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae three times length and two times thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.53. Halter blackish-brown, with narrow yellow marking. Apex of hind femur without anterior or posterior dark spot. Tergite 1 dark brown, lightened anteriorly and posteriorly; tergite 2 blackish-brown, light brown anteriorly, medially, and along posterior margin; tergites 3–5 brown, slightly lighter medially, blackish-brown laterally; tergite 6 light brown anteriorly, blackish-brown posteriorly. Venter of abdomen yellowish-brown, darkening posteriorly. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–4 bare. Venter of segment 5 with round, lightly sclerotized sternite and row of thin setae. Venter of abdominal segment 6 large, round, lightly sclerotized sternite; apical margin with series of short peglike setae. Ovipositor greatly expanded at midlength, lateral margins of expansion extremely thick; ovipositor narrowed posteriorly, parallel-sided. Ovipositor dorsally with one pair of long setae at apical one-third.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. This species is named for my friend and colleague, Dr. Michael Sharkey.

HOLOTYPE. ♀, COSTA RICA: Limón: 16 km W Guapiles, 10.15°N, 83.92°W, i–iv.1991, P. Hanson, Malaise trap, 400 m (LACM) [LACM ENT 013171].

PARATYPES. ♀, COSTA RICA: Limón: 16 km W Guapiles, 10.15°N, 83.92°W, 1♀, iv–v.1989, 1♀, viii–ix.1989, 4♀, i–iv.1991, P. Hanson, Malaise trap, 400 m (INBC, LACM, MUCR).

Apocephalus similis Malloch
(Fig. 43)

Apocephalus similis Malloch, 1912:444, pl. 38 fig. 7, 12–13. Borgmeier, 1963:174–176, fig. 173.

HOLOTYPE. ♀, USA: Arizona: Madera Canyon, 13.vi.1898, E.A. Schwarz, over *Camponotus sansabeanus* (examined; USNM) [USNM type #14837].

REMARKS. In North America, this species is recognized by the shape of the ovipositor and the narrow expansion at midlength (Fig. 43; see discussion under *A. pergandei* above). Neotropical species with narrow ovipositors are discussed under *A. strictus* above.

DESCRIPTION. Body length 1.28–1.9 mm. Frons dark brown. Frontal ratio 1. Flagellomere 1 light brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae three times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and thickness of anterior pair. Pleuron light brown. Mean costal ratio 0.41. Halter yellowish-brown, anteroapical half brown. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown, lighter anteriorly and posteriorly; tergite 2 brown, anterior two-fifths light brown, light brown medially and along posterior margin, tergite 2 sometimes entirely light brown; tergites 3–5 light brown, laterally dark brown, tergites 3–4 sometimes with light brown narrowed to a medial strip; tergite 6 dark brown to blackish-brown. Venter of abdomen light brown to grayish-brown. Ventrolateral setae of tergite 6 greatly enlarged, bristlelike. Venter of abdominal segments 1–3 bare, segments 4 and 5 with posterior row of thin setae. Venter of abdominal segment 6 with large, square, lightly sclerotized sternite with row of thin setae across posterior third. Ovipositor slightly expanded at midlength, slightly narrowing apically. Ovipositor dorsally with one pair of long setae at apical one-third.

GEOGRAPHICAL DISTRIBUTION. Arizona and Texas.

HOST. This species has only been found in association with *Camponotus sansabeanus* in the southwestern United States. The record of its as-

sociation with *C. vicinus* Mayr, 1870, published by Disney (1994) was based on an incorrect determination of the ant host of the holotype that I relayed to him. The ant specimen has been reexamined by R. Snelling (Natural History Museum of Los Angeles County) and the identification corrected.

OTHER MATERIAL EXAMINED. USA: Arizona: Cochise Co., Cochise Stronghold, 31.92°N, 109.97°W, 16♀, 17.viii.1993, B.V. Brown, over *Camponotus sansabeanus* (LACM), 2♀, 18.viii.1993, D.H. Feener, attracted to *Camponotus sansabeanus* extract, 19♀, 19.viii.1993, B.V. Brown, over *Camponotus sansabeanus*, 3♀, 16–20.viii.1993, B.V. Brown, white pan traps (LACM, MCZC, NHRS), 8.4 km W Portal, 31.88°N, 109.20°W, 1♀, 5.vii.1995, S. Gaimari, Malaise trap, 1520 m (LACM), 18.5 km W Portal, Basin Trail head, 2♀, 8–10.vii.1987, B. Brown, T. Spanton, yellow pan traps (LACM), Santa Cruz Co., Madera Canyon, 2♀, 1.viii.1988, B.V. Brown, over *Camponotus sansabeanus* (LACM); Texas: Travis Co., Austin, 1♀ [no date], A.L. Melander, over *Camponotus sansabeanus* (USNM).

"Apocephalus lanceatus-subgroup"

DIAGNOSIS. At present, I have no character states to justify this grouping as a monophylum, although there are some demonstrably monophyletic groups within it. Overall, the species share a compact body and relatively similar ovipositor structure, the latter of which might in the future be found to possess some diagnostic characters. In particular, there is a well-developed basal sclerite ventrally on the ovipositor that projects slightly below the rest of the structure (Figs. 70, 71) and is sometimes greatly developed (e.g., Fig. 48); however, a similar basal sclerite exists in some *A. pergandei*-subgroup species (such as *A. cyathus*).

Apocephalus facettalis-series

DIAGNOSIS. Apical sclerite of dorsum of ovipositor with anteriorly directed processes (Figs. 44, 46, 47, 49, 50). Flagellomere 1 enlarged, elongate, slightly pointed, flattened (Fig. 85). Lateral margin of scutum whitish in color; dorsum light brown.

Apocephalus ctenicoxa new species

(Figs. 44, 45, 85)

REMARKS. This is the only *Apocephalus* species with rows of ctenidia (combs of dense, thick setae) on the fore femur (Fig. 45).

DESCRIPTION. Body length 2.7–3.15 mm. Frons dark brown. Frontal ratio 0.94. Flagellomere 1 light brown, elongate-oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown to light brown. Scutum brown, slightly lighter at lateral margins. Scutellum dark brown. Anterior pair of scutellar setae two and one-half times length and twice thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair.

Pleuron yellowish-brown. Mean costal ratio 0.54. Halter blackish-brown, with narrow yellow marking. Apex of hind femur without anterior dark spot, but with small posterior dark spot. Tergites blackish with a lightened medial strip; tergite 6 lightened anteriorly. Venter of abdomen yellowish-brown. Venter of abdominal segments 1–5 bare; segment 6 with mediolateral group of medium-sized, thick setae. Ovipositor (Fig. 44) relatively short, with medial darkening with anterior arms; apex truncate. Ventral apex of ovipositor pointed, short, curved ventrally. Basal sclerite narrow, elongate, extending nearly to tip of ventral apex of ovipositor. Ventroapical margin of ovipositor with several curved, long setae.

VARIATION. The specimen from Ecuador [LACM ENT 041220] is unusually small and has flagellomere 1 dark brown. The specimen from Brazil [LACM ENT 137064] is also small and has the ctenidia on the fore femur extremely short and sparse; it appears also to have been bleached by sunlight, as the colors are faded. Further specimens of this species from Brazil, Ecuador, and intervening areas are needed to properly assess the status of these variants.

GEOGRAPHICAL DISTRIBUTION. Costa Rica; single specimens from Ecuador and Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is from a Greek word, *ktenos*, for comb, referring to the rows of enlarged setae on the fore-coxae.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 15–21.v.1989, B. Brown, D. Feener, Malaise trap, [trail] SOR@SHO (LACM) [LACM ENT 001558].

PARATYPES. BRAZIL: Espirito Santo: Aracruz, 19.80°S, 40.28°W, 1♀, v.1993, M. Bragança, Malaise trap, 60 m, *Eucalyptus* plantation (LACM). COSTA RICA: Cartago: Turrialba, 9.93°N, 83.67°W, 1♀, 15–19.vii.1966, P. Spangler, Malaise trap (USNM); Guanacaste: Santa Rosa National Park, 10.95°N, 85.62°W, 2♀, 6–27.ix.1986, I. Gauld, D. Janzen, Malaise trap SE-6-C, 3♀, 27.ix–18.x.1986, I. Gauld, D. Janzen, Malaise trap SE-6-C, 7♀, 18.x–8.xi.1986, I. Gauld, D. Janzen, Malaise trap BH-9-O, BH-11-O, H-3-O, 1♀, 21.ii–14.iii.1987, I. Gauld, D. Janzen, Malaise trap BH-9-O (LACM); Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 14♀, 21.i–3.ii.1991, J. Noyes, Malaise trap (BMNH, LACM, MCZC, MZSP, NHRS, SEMC), 1♀, iv.1991, 2♀, ix.1992, P. Hanson, Malaise trap (LACM, MUCR), 4♀, 1–6.vii.1993, B. Brown, D. Feener, Malaise trap #1 (LACM), 1♀, 16.ii–2.iii.1993, ALAS, Malaise trap M/07/022, 2♀, 15.iii.1993, ALAS, Malaise trap M/02/033, M/07/038, 4♀, 15.iii–1.iv.1993, ALAS, Malaise trap M/02/049, M/05/052, M/10/057, M/15/062, 3♀, 1–15.iv.1993, ALAS, Malaise trap M/10/73, M/12/075, M/15/078, 2♀, 15.iv–1.v.1993, ALAS, Malaise trap M/02/081, M/04/083, 1♀, 18.v.1993, ALAS, Malaise trap M/02/97, 2♀, 1–15.vi.1993, ALAS, Malaise trap M/10/132, M/14/

120, 2♀, 1.vii.1993, ALAS, Malaise trap M/06/151, M/12/146, 2♀, 3.viii.1993, ALAS, Malaise trap M/07/169, 1♀, 1.xi.1993, ALAS, Malaise trap M/02/249, 1♀, 15.xii.1993, ALAS, Malaise trap M/02/293, 1♀, 3.i.1994, ALAS, Malaise trap M/03/306, 3♀, 15.i.1994, ALAS, Malaise trap M/02/321, M/14/316, 1♀, 1.ii.1994, ALAS, Malaise trap M/13/343, 8♀, 1.iii.1994, ALAS, Malaise trap M/05/364, M/07/365, M/12/370, 4♀, 4.iv.1994, ALAS, Malaise trap M/03/381, M/09/387, M/11/389, 1♀, 17.vii.1995, ALAS, Malaise trap M/10/407, 3♀, 1.xii.1995, ALAS, Malaise trap M/12/517, 1♀, 2.i.1996, Malaise trap M/01/531, 1♀, 31.v.1996, ALAS, Malaise trap M/03/653, 1♀, 2.x.1997, ALAS, Malaise trap M/18/683, 4♀, 3.iv.2000, Malaise trap M/19/2000 (INBC, LACM); Limón: 7 km SW Bribri, 9.58°N, 82.88°W, 1♀, ix–xi.1989, 1♀, xii.1989–ii.1990, P. Hanson, Malaise trap (LACM); Puntarenas: Cerro Rincon, 8.52°N, 83.47°W, 1♀, ii.1991, 1♀, iii.1991, P. Hanson, Malaise trap, 745 m (LACM). ECUADOR: Sucumbios: Sacha Lodge, 0.5°S, 75.5°W, 1♀, 27.viii–10.ix.1994, P. Hibbs, Malaise trap, 270 m (LACM).

Apocephalus facettalis Borgmeier
(Figs. 46)

Apocephalus facettalis Borgmeier, 1961:52–54, fig. 61.

HOLOTYPE. ♀, BRAZIL: Rio de Janeiro: Taquara, Jacarepaguá, 11.xii.1949, T. Borgmeier (examined; MZSP).

REMARKS. Of the four remaining *A. facettalis*-series species (excepting the distinctive *A. ctenicoxa*, above, which has already been diagnosed), *A. facettalis* is the most widespread. It differs from *A. ponderosus* new species by having a narrower dorsoapical sclerite (compare Figs. 46, 49). Unlike that of *A. pluteus* new species (Fig. 48), the ovipositor of *A. facettalis* has a short ventrobasal process that does not extend to near the apex of the ovipositor. The other similar species, *A. superatus*, has the heavily sclerotized dorsoapical sclerite raised and convex in appearance (Fig. 50), whereas in *A. facettalis*, the apical section of the ovipositor is flat.

DESCRIPTION. Body length 1.85–2.55 mm. Frons dark brown. Frontal ratio 0.92. Flagellomere 1 light brown, pyriform to elongate. Supra-antennal setae absent. Palpus brown. Scutum light brown, anterior quarter slightly darker. Scutellum brown to dark brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.55. Halter blackish-brown, with narrow yellow marking. Apex of hind femur without anterior dark spot, posterior dark spot may be present or absent. Tergite blackish-brown. Tergite 1 lightened anteriorly and medially; tergite 2 light brown anteriorly, medially, and along posterior margin; ter-

gites 3–5 with narrow, light brown medial line; tergite 6 light brown in anterior two-fifths. Venter of abdomen yellow to yellowish-brown. Venter of abdominal segments 1–5 bare; segment 6 with medio-lateral short sclerites, each with a few long, thick setae. Ovipositor elongate, dorsal sclerite posteriorly pointed, with anteriorly directed arms; with small group of posterolateral setae. Ventral apex of ovipositor elongate, heavily sclerotized, with light-colored medial region. Basal sclerite narrow, semi-circular.

VARIATION. Specimens from Ecuador have darker flagellomeres and extremely short ovipositors, possibly representing a separate species. At this time, however, I group them with other *A. facettalis* at least until more comparative material has been collected from other South American localities.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Amazonia.

HOST. We observed females of this species darting at *Camponotus* species workers that were evacuating their nest in response to a raid by the army ant *Eciton rapax* Fr. Smith, 1855 (see "Other Material Examined" from Peru). Unfortunately, we collected no voucher specimens of the ants.

OTHER MATERIAL EXAMINED. BRAZIL: Amazonas: Reserva Ducke, 3.13°S, 60.02°W, 1♀, 6–17.vii.1992, J. Vidal, Arm. Cola 14–1 m (INPA). COLOMBIA: Amazonas: Amacayacu National Park, 3.82°S, 70.26°W, 1♀, x.1989, M. Kelsey, Malaise trap, varzea forest (UNCB). COSTA RICA: Guanacaste: Santa Rosa National Park, 10.95°N, 85.62°W, 1♀, 18.x–8.xi.1986, I. Gauld, D. Janzen, Malaise trap H-3-O (LACM); Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 22♀, 21.i–3.ii.1991, J. Noyes, Malaise trap (BMNH, LACM), 1♀, iv.1991, P. Hanson, Malaise trap (LACM), 2♀, 15.ii–1.iii.1993, ALAS, Malaise trap M/01/16, M/08/23, 1♀, 15.iii.1993, ALAS, Malaise trap M/07/038, 1♀, 2.v.1993, ALAS, Malaise trap M/04/083, 1♀, 1–15.v.1993, ALAS, Malaise trap M/10/104, 1♀, 18.v.1993, ALAS, Malaise trap M/01/096, 1♀, 19.v.1993, ALAS, Malaise trap M/11/105, 1♀, 1.vi.1993, ALAS, Malaise trap M/07/113 (INBC, LACM), 11♀, 1–6.vii.1993, 1♀, 6–11.vii.1993, B. Brown, D. Feener, Malaise trap #1 (LACM), 1♀, 3.viii.1993, ALAS, Malaise trap M/07/169, 1♀, 1–14.viii.1993, ALAS, Malaise trap M/08/186, 1♀, 1.xi.1993, ALAS, Malaise trap M/02/249, 1♀, 4.iv.1994, ALAS, Malaise trap M/09/387 (INBC, LACM), 4♀, iv–v.1995, P. Hanson, Malaise trap (LACM), 2♀, 30.vi.1995, ALAS, Malaise trap M/03/389, 1♀, 2.i.1996, ALAS, Malaise trap M/01/531, 9♀, 3.iv.2000, Malaise trap M/19/745 (INBC); Limón: 7 km SW Bribri, 9.58°N, 82.88°W, 2♀, ix–xi.1989, 1♀, xii.1989–ii.1990, P. Hanson, Malaise trap, 50 m (LACM), 16 km W Guapiles, 10.15°N, 83.92°W, 1♀, iii–v.1990, 1♀, vii–xi.1990, 2♀, i–iv.1991, P. Hanson, Malaise trap, 400 m (LACM); Puntarenas: Cerro Rincon, 8.52°N, 83.47°W, 2♀, ii.1991, P. Hanson, Malaise

trap, 745 m (LACM), Coopemarti, 8.63°N, 83.47°W, 1 ♀, ii.1991, P. Hanson, Malaise trap, 30 m (LACM), 24 km W Piedras Blancas, 8.77°N, 83.40°W, 1 ♀, ii–iii.1989, 2 ♀, iii–v.1989, 3 ♀, x.1990, 1 ♀, xi.1990, 1 ♀, xii.1990, 1 ♀, i–iii.1991, 1 ♀, x.1991, 1 ♀, i.1992, 3 ♀, ii.1992, P. Hanson, Malaise trap, 200 m (LACM), 5 km N Puerto Jimenez, 8.55°N, 83.35°W, 4 ♀, i.1991, P. Hanson, Malaise trap, 10 m (LACM), 3 km SW Rincon, 8.68°N, 83.48°W, 1 ♀, iii.1989, 1 ♀, ix–xi.1989, 1 ♀, xii.1989, 1 ♀, x–xii.1990, 2 ♀, i–iii.1991, 23 ♀, iii–iv.1991, 2 ♀, viii.1991, 1 ♀, ix.1991, 7 ♀, x.1991, 18 ♀, xi.1991, 11 ♀, xii.1991, 4 ♀, ii.1992, 2 ♀, i.1993, 1 ♀, ii.1993, P. Hanson, Malaise trap, 10 m (LACM, MCZC, MUCR, NHRS, SEMC), 1 ♀, 5 km SW Rincon, 8.7°N, 83.51°W, 1 ♀, 31.v–7.vi.1998, B. Brown, V. Berezovskiy, Malaise trap #3 (LACM); San José: 26 km N San Isidro, 9.5°N, 83.72°W, 1 ♀, ii–v.1992, P. Hanson, Malaise trap, 2100 m (LACM). ECUADOR: Guyas: Rio Frio, Balao Chico, 2.73°S, 79.75°W, 26–30.ix.1963, L. Peña (CNCL); Sucumbios: Sacha Lodge, 0.5°S, 76.5°W, 1 ♀, 16–27.viii.1994, 8 ♀, 10–21.x.1994, 2 ♀, 21.xi–1.xii.1994, 4 ♀, 1–31.xii.1994, P. Hibbs, Malaise trap, 270 m (LACM, QCAZ). PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 1 ♀, 18–25.ix.1996, J. Pickering, Malaise trap #6894 (LACM). PERU: Madre de Dios: Zona Reserva Manu, Pakitza, 11.95°S, 71.28°W, 9 ♀, 26.ii.1992, B. Brown, D. Feener, swarm raid of *Eci-ton rapax* (LACM, MUSM, USNM), 1 ♀, 7–9.iii.1992, R. Cambra, Malaise trap (MIUP).

Apocephalus pluteus new species

(Figs. 47, 48)

REMARKS. This species differs from others of the *A. facettalis*-series by the extremely elongate ventrobasal process of the ovipositor (Fig. 48).

DESCRIPTION. Body length 2 mm. Frons blackish-brown. Frontal ratio 1. Flagellomere 1 orange-brown, oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown. Scutum brown, slightly lighter at lateral margins. Scutellum brown. Anterior pair of scutellar setae four times length and three times thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.52. Halter blackish-brown. Apex of hind femur without anterior or posterior dark spot. Tergites blackish-brown. Tergite 1 lightened anteriorly and medially; tergite 2 light brown anteriorly, medially, and along posterior margin; tergites 3–5 with narrow, light brown medial line; tergite 6 light brown in anterior two-fifths. Venter of abdomen yellow. Venter of abdominal segments 1–5 bare; segment 6 with lateral groups of three long setae (slightly sclerotized around bases). Ovipositor relatively short (but damaged in holotype female), truncate apically (Fig. 47), with large, apically truncate sclerite; sclerite with anteriorly directed arms; laterally oviposi-

tor with relatively long dorsal setae. Ventral apex pointed, exceeding dorsal apex in length. Basal sclerite extremely large, rounded; terminating at apex of ventral apex of ovipositor.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Venezuela.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for shelf, referring to the enlarged ventrobasal sclerite of the ovipositor.

HOLOTYPE. ♀, VENEZUELA: Zulia: 45 km SW of Machiques, El Tucuco, 5–6.vi.1976, A.S. Menke, D. Vincent (USNM) [LACM ENT 050918].

Apocephalus ponderosus new species

(Fig. 49)

REMARKS. This species differs from others of the *A. facettalis*-series by the broad dorsoapical sclerite and the short, thick apical setae (Fig. 49).

DESCRIPTION. Body length 2.2–2.5 mm. Frons blackish-brown. Frontal ratio 1.04. Flagellomere 1 yellow to light brown, oval, apically pointed. Supra-antennal setae absent. Palpus light brown. Scutum brown; yellowish-brown anterolaterally and posterolaterally. Scutellum dark brown. Anterior pair of scutellar setae one and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellow. Mean costal ratio 0.55. Halter blackish-brown, with narrow yellow marking. Apex of hind femur with small, brown anterior and posterior dark spots. Tergite blackish-brown. Tergite 1 lightened anteriorly and medially; tergite 2 light brown anteriorly, medially, and along posterior margin; tergites 3–5 with narrow, light brown medial line; tergite 6 light brown in anterior two-fifths. Venter of abdomen yellow. Venter of abdominal segments 1–5 bare; segment 6 with lateral groups of 3–4 long setae whose bases are surrounded by small sclerotized area. Ovipositor elongate, slightly constricted at midlength, with large, broad apical sclerite; sclerite with anteriorly directed arms; ovipositor with posterolateral groups of short, thick setae. Ventral apex pointed, elongate. Basal sclerite short, ridge small.

GEOGRAPHICAL DISTRIBUTION. Barro Colorado Island, Panama.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for heavy, referring to the broad, thickened ovipositor of this species.

HOLOTYPE. ♀, PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 31.vii–7.viii.1996, J. Pickering, Malaise trap #6749 (LACM) [LACM ENT 085351].

PARATYPES. PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 1 ♀, 6–13.i.1993, J. Pickering, Malaise trap #702, 1 ♀, 20–27.i.1993, J. Pickering, Malaise trap #736, 1 ♀, 3–10.iii.1993, J. Pickering, Malaise trap #932, 3 ♀, 24–31.iii.1993, J. Pickering, Malaise trap #935, #959, 3 ♀, 1–7.iv.1993, J. Pickering, Malaise trap

#936, 1 ♀, 23.iv–9.v.1993, J. Pickering, Malaise trap #964, 2 ♀, 5–12.v.1993, J. Pickering, Malaise trap #941, #965, 3 ♀, 12–19.v.1993, J. Pickering, Malaise trap #942, 1 ♀, 6–13.iv.1994, J. Pickering, Malaise trap #2419, 2 ♀, 1–7.vi.1994, J. Pickering, Malaise trap #2382, 1 ♀, 22–29.v.1996, J. Pickering, Malaise trap #6614, 1 ♀, 24–31.vii.1996, J. Pickering, Malaise trap #6730 (LACM, MCZC, MIUP, USNM).

Apocephalus superatus new species

(Fig. 50)

REMARKS. This species differs from others of the *A. facetalis*-series species by the raised, convex dorsal apex of the ovipositor (Fig. 50).

DESCRIPTION. Body length 2.05–2.15 mm. Frons dark brown. Frontal ratio 1. Flagellomere 1 light brown to brown, elongate. Supra-antennal setae absent. Palpus brown. Scutum brown, lighter posteriorly. Scutellum dark brown. Anterior pair of scutellar setae four times length and three times thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.56. Halter blackish-brown. Apex of hind femur without anterior dark spot, but with posterior dark spot. Tergites blackish-brown; tergites 1–2 light brown along anterior and posterior margins; tergite 3 light brown medially and along posterior margin; tergite 4 light brown anteriorly, medially, and along posterior margin; tergite 5 light brown posterior margin, with or without light brown medially; light brown anteriorly and along posterior margin. Venter of abdomen yellowish-brown, segment 6 brown. Venter of abdominal segments 1–5 bare; segment 6 with row of long, thick setae. Ovipositor short. Dorsal apex broadly pointed, with pair of long posterior setae. Dorsal sclerotization basally light, even; at midlength with central clear area; apically with large, dark triangular sclerite with anteriorly directed arms; posterior apex of triangular sclerite raised to form medial ridge. Ventral apex narrow, pointed, subequal in length to dorsal apex. Basal sclerite narrow, projecting posteriorly, with one long lateroventral seta.

GEOGRAPHICAL DISTRIBUTION. Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for rise above, referring to the raised central portion of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Limón: 16 km W Guapiles, 10.15°N, 83.92°W, i–iv.1991, P. Hanson, Malaise trap, 400 m (LACM) [LACM ENT 013161].

PARATYPES. COSTA RICA: Alajuela: 2 km W Dos Rios, 1 ♀, viii.1988, [no collector], 600 m (LACM); Guanacaste: 9 km S Santa Cecilia, Estación Pitilla, 1 ♀, 22.viii.1993, C. Moraga, Malaise trap #2322 (INBC); Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 2 ♀, 21.i–3.ii.1991, J.

Noyes, Malaise trap (BMNH, LACM), 1 ♀, 15.iii.1993, ALAS, Malaise trap M/01/32, 1 ♀, 15.iii–1.iv.1993, ALAS, Malaise trap M/10/057, 1 ♀, 1–15.iv.1993, ALAS, Malaise trap M/15/78, 1 ♀, 2.v.1993, ALAS, Malaise trap M/09/88, 2 ♀, 18.v.1993, ALAS, Malaise trap M/04/099, M/13/107, 4 ♀, 1.vi.1993, ALAS, Malaise trap M/04/111, M/07/113, M/15/121, 1 ♀, 14.vi.1993, ALAS, Malaise trap M/07/129, 1 ♀, 1.vii.1993, ALAS, Malaise trap M/07/141, 2 ♀, 14.viii.1993, ALAS, Malaise trap M/14/176, 1 ♀, 1.ix.1993, ALAS, Malaise trap M/07/197, 1 ♀, 10.x.1993, ALAS, Malaise trap M/07/225, 1 ♀, 1.xi.1993, ALAS, Malaise trap M/08/489, 1 ♀, 3.i.1994, ALAS, Malaise trap M/07/309, 1 ♀, 16.i.1994, ALAS, Malaise trap M/14/316, 1 ♀, 15.ii.1994, ALAS, Malaise trap M/10/356, 1 ♀, 2.iii.1994, ALAS, Malaise trap M/14/372, 1 ♀, 30.vi.1995, ALAS, Malaise trap M/03/389, 1 ♀, 14.ix.1995, ALAS, Malaise trap M/10/455, 1 ♀, 1.xi.1995, ALAS, Malaise trap M/04/486, 1 ♀, 14.xii.1995, ALAS, Malaise trap M/12/529, 1 ♀, 1.ii.1996, ALAS, Malaise trap M/02/556, 1 ♀, 16.ii.1996, ALAS, Malaise trap M/12/577, 1 ♀, 1.iv.1996, ALAS, Malaise trap M/10/611 (INBC, LACM, MCZC, USNM); Limón: 16 km W Guapiles, 10.15°N, 83.92°W, 2 ♀, i–iv.1991, 1 ♀, vi–ix.1991, P. Hanson, Malaise trap, 400 m (LACM, MUCR).

Apocephalus velutinus-series

DIAGNOSIS. Apex of ovipositor curved dorsally (Fig. 52).

Apocephalus anacurvus new species

(Figs. 51, 52)

REMARKS. This is a distinctive, dark brown species (most *Apocephalus* are light brown in color) that can be recognized by the strongly upturned posterior apex of the ovipositor (Fig. 52).

DESCRIPTION. Body length 1.53–2.09 mm. Frons dark brown. Frontal ratio 1.12. Flagellomere 1 light brown, darker than palpus, oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown to light brown. Scutum brown to dark brown, yellowish-brown posteriorly. Scutellum dark brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and three times thickness of anterior pair. Pleuron brown to dark brown. Mean costal ratio 0.51. Halter blackish-brown. Apex of hind femur with anterior and posterior dark spots. Tergites blackish-brown; tergites 1–2 light brown anteriorly and along posterior margin; tergite 3 with or without lightened posterior margin; tergite 4 blackish-brown; tergites 5–6 with or without lightened anterior margin. Venter of abdomen dark gray. Venter of abdominal segments 1–3 bare; 4–5 with small, scattered setae; segment 6 with lateral groups of three large setae. Ovipositor elongate (Fig. 51); dorsal apex strongly curved dorsally, pointed, with sev-

eral medial and posterior setae. Dorsally ovipositor with raised ridge across basal one-third, posterior lightly sclerotized area; apical two-thirds of ovipositor evenly sclerotized except for light colored line across apical one-third. Ventral apex elongate pointed, slightly longer than dorsal apex. Basal sclerite small, triangular.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Amazonia.

DERIVATION OF SPECIFIC EPITHET. The name is from a Greek word, *ana*, for upwards, and a Latin word, *curvus*, for curved, referring to the apex of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: 5 km W Piedras Blancas, 8.77°N, 83.28°W, xi.1991, P. Hanson, Malaise trap, 100 m (LACM) [LACM ENT 013113].

PARATYPES. BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 3 ♀, 6–17.vii.1992, J. Vidal, Arm. Cola 1B-20 m, 14-20 m, 18-1 m (INPA, LACM). COSTA RICA: Cartago: Turrialba, 9.93°N, 83.67°W, 1 ♀, 15–19.vii.1966, P. Spangler, Malaise trap (USNM); Limón: 4 km NE Bribri, 9.63°N, 82.82°W, 2 ♀, xii.1989–iii.1990, P. Hanson, Malaise trap (LACM), Pandora, Estrella Valley, 9.73°N, 82.97°W, 1 ♀, 28.iii.1984, G.V. Manley, Malaise trap (LACM); Puntarenas: 24 km W Piedras Blancas [= 24 km W Pan American Highway on some labels], 8.77°N, 83.40°W, 12 ♀, iii–iv.1989, 1 ♀, x.1990, 1 ♀, xii.1990, P. Hanson, Malaise trap, 200 m (INBC, LACM, MCZC, MUCR, NHRS), 3 km SW Rincon, 8.68°N, 83.48°W, 1 ♀, iii–v.1991, P. Hanson, Malaise trap, 10 m (LACM).

Apocephalus setiventris Borgmeier

(Fig. 53)

Apocephalus setiventris Borgmeier, 1971:113–114, fig. 154.

HOLOTYPE. ♀, BRAZIL: Paraná: Rio Negro, 7.v.1925, T. Borgmeier, with *Camponotus* (*Myrmobrachys*) *crassus* (examined; MZSP).

REMARKS. This is a dark brown species, similar to *A. anacurvus*, but with the apex of the ovipositor much less modified and only slightly curved dorsally (Fig. 53).

DESCRIPTION. Body length 1.4–1.6 mm. Frons brown. Frontal ratio 1.04. Flagellomere 1 orange basally, with dark anterior apex, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum brown. Scutellum brown. Anterior pair of scutellar setae one and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae about two and one-half times length and thickness of anterior pair. Pleuron dark brown. Mean costal ratio 0.5. Halter dark brown. Apex of hind femur without anterior or posterior dark spot. Tergites dark. Venter of abdomen dark gray. Venter of abdominal segments 1–3 bare; segments 4–6 with posterior row of long setae. Ovipositor curved dorsally at apex, with two medial rows of relatively

thick setae and several lateral setae. Venter of ovipositor bluntly pointed. Basal sclerite oval.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southeastern Brazil.

HOST. Borgmeier (1971) gives *Camponotus crassus* as the host but also lists a single male specimen collected with *C. rufipes*. The male was collected at a different site, Itaipava in Rio de Janeiro state, however, and its association with the females of *A. setiventris* is questionable.

OTHER MATERIAL EXAMINED. 3 ♀ paratypes, same data as holotype (LACM, MZSP), 1 ♀ paratype, 11.v.1925 (MZSP).

Apocephalus velutinus Borgmeier

(Fig. 54)

Apocephalus velutinus Borgmeier, 1958:346–347, figs. 47, 49.

HOLOTYPE. ♀, BRAZIL: Santa Catarina: Nova Teutônia, iv.1950, F. Plaumann (examined; MZSP) [LACM ENT 037968].

REMARKS. Unlike others in the *A. velutinus*-series, this species is much more lightly colored, especially the venter of the abdomen. Its ovipositor (Fig. 54) is most similar to that of *A. setiventris*, but it does not have thick dorsomedial setae.

DESCRIPTION. Body length 1.43 mm. Frons dark brown. Frontal ratio 1.12. Flagellomere 1 light brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae one and one-half times length and about equal thickness of posterior setae of scutum. Posterior pair of scutellar setae two and one-half times length and four times thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.5. Halter dark brown. Apex of hind femur with anterior and posterior dark spots. Tergite 1 blackish-brown; tergite 2 light brown with two blackish-brown spots dorsally, blackish-brown laterally; tergite 3 light brown, blackish-brown laterally; tergites 4–5 blackish-brown, light brown anteriorly and medially; tergite 6 light brown, brown along posterior margin. Venter of abdomen yellowish-brown, segment 6 brown. Venter of abdominal segments 1–4 bare; segment 5 with row of short, thin setae; segment 6 with row of longer, thicker setae. Ovipositor elongate. Dorsal apex pointed, curved dorsally, with short, lateral setae. Dorsal sclerotization light, even, except for white line across midlength. Ventral apex elongate, pointed, subequal in length to dorsal apex. Basal sclerite broad, semicircular, not well defined.

GEOGRAPHICAL DISTRIBUTION. Guatemala to southeastern Brazil.

OTHER MATERIAL EXAMINED. BRAZIL: Minas Gerais: Belo Horizonte, UFMG campus, 19.92°S, 43.97°W, 1 ♀, 25–29.v.1993, 5 ♀, 25.v–11.vi.1993, 2 ♀, 4–7.vi.1993, S. Gaimari, Malaise trap, 800 m (BHMH, LACM); Santa Catarina: Nova Teutônia, 5 ♀ paratypes, same data as holotype (MCZC, MZSP, USNM). COSTA RICA: Pun-

arenas: 5 km W Piedras Blancas, 8.77°N, 83.28°W, 1♀, xii.1990, P. Hanson, Malaise trap, 10 m (LACM). GUATEMALA: Suchitepequez: San Antonio de Suchitepequez, 1♀, 6.vii.1965, P. Spangler, Malaise trap (USNM). PANAMA: San Blas: Nusagandi Reserve, 9.33°N, 79.0°W, 1♀, 16-23.iv.1994, J. Pickering, Malaise trap #2862 (LACM).

Other *Apocephalus lanceatus*-subgroup

Apocephalus albiapex new species

(Fig. 55)

REMARKS. This species is recognized by the dark flagellomere 1 with a strikingly white apex, the presence of several long, dark setae on the venter of abdominal segments 4-6, and the structure of the ovipositor (Fig. 55, see "Variation" for further discussion).

The other similar species with a lighter apex of flagellomere 1 is *A. clarilocus* new species, but it has much longer setae near the apex of the ovipositor (Fig. 63).

DESCRIPTION. Body length 2.05-3.05 mm. Frons brown to dark brown. Frontal ratio 0.99. Flagellomere 1 brown with whitish anterior apex, oval. One pair of small supra-antennal setae present. Palpus light brown. Scutum brown to dark brown, yellowish-brown posteriorly. Scutellum dark brown. Anterior pair of scutellar setae one and one-half times length and about equal thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.55. Halter blackish-brown. Apex of hind femur without anterior dark spot, but with posterior dark spot. Tergites blackish-brown; tergites 1-5 yellowish-brown to light brown medially; tergite 6 lightened anteriorly. Venter of abdomen yellow to yellowish-brown. Venter of abdominal segments 1-3 bare; segments 4-6 with posterior row of long, thick setae, in some specimens those of segments 4 and 5 appearing to be in pairs. Ovipositor elongate, dorsal apex broadly rounded, with one dorsal and one ventrolateral pair of longer setae. Ventral apex of ovipositor narrowed, bluntly pointed, much longer than dorsal apex. Basal sclerite short, lens-shaped.

VARIATION. It is possible that more than one species is encompassed by the description of *A. albiapex*. The holotype and most other specimens from Costa Rica and Panama, and some specimens from Brazil, conform to the description above, being relatively large, with yellowish venter of the abdomen, with tergites marked with yellow, and with relatively disorganized ventral setae on segments 4 and 5. In contrast, specimens from Brazil and Ecuador and some specimens from Costa Rica are much smaller, with grayish venter of the abdomen, less (or no) yellow marking on the tergites, and ventral setae organized into pairs on segments 4 and

5. The color of flagellomere 1 and the structure of the ovipositor is the same, however, so for now I treat these all as a single variable species.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Amazonia.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for white tip, referring to the color of flagellomere 1 of the antennae.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 8-15.v.1989, B. Brown, D. Feener, Malaise trap, CC 400 (LACM) [LACM ENT 001561].

PARATYPES. BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 2♀, 8-15.iv.1992, J. Vidal, Arm. Cola 14-20 m, 2♀, 6-17.vii.1992, J. Vidal, Arm. Cola 14-1 m, 18-1 m, 1♀, 4-13.xi.1992, J. Vidal (INPA, LACM). COSTA RICA: Guanacaste: Estación Pitilla, 1♀, vi.1994, P. Rios, Malaise trap #2996 (INBC), Volcan Cacao, Cerro Pedregal, 1♀, ii-iv.1989, I. Gauld, D. Janzen, Malaise trap, 1000 m (LACM); Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 2♀, 2.iii.1993, ALAS, Malaise trap M/02/017, M/15/030, 3♀, 2.iv.1993, ALAS, Malaise trap M/14/061, M/15/062, 1♀, 1-15.iv.1993, ALAS, Malaise trap M/15/078, 1♀, 19.v.1993, ALAS, Malaise trap M/12/106, 2♀, 1.vi.1993, ALAS, Malaise trap M/07/113, M/12/118, 1♀, 14.vi.1993, ALAS, Malaise trap M/12/134, 2♀, 3.viii.1993, ALAS, Malaise trap M/12/174, 1♀, 16.ix.1993, ALAS, Malaise trap M/12/218 (INBC, LACM), 1♀, iv-v.1995, P. Hanson, Malaise trap (MUCR). ECUADOR: Sucumbios: Sacha Lodge, 0.5°S, 76.5°W, 1♀, 20-30.ix.1994, P. Hibbs, Malaise trap, 270 m (LACM). PANAMA: Darien: Cruce de Mono, Estación Inrenare, 7.92°N, 77.62°W, 1♀, 6.ii-4.iii.1993, R. Cambra, J. Coronado, Malaise trap (LACM).

Apocephalus altus new species

(Fig. 56)

REMARKS. This species can be recognized by the light brown, pointed flagellomere 1, the setation of the venter of the abdomen, and the structure of the ovipositor (Fig. 56).

DESCRIPTION. Frons dark brown. Frontal ratio 1.19. Flagellomere 1 light brown, oval, apically pointed. One pair of barely differentiated supra-antennal setae present. Palpus light brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.56. Halter blackish-brown. Apex of hind femur without anterior dark spot, but with posterior dark spot. Venter of abdominal segments 1-2 bare; segments 3-5 with one pair of setae; segment 6 with row of longer, thicker setae. Ovipositor elongate, dorsal apex broadly rounded, with short setae posterolaterally and medially below midlength. Dorsal sclerotiza-

tion even, with lateromedial darkenings at apex. Ventral apex broad, bluntly pointed, extending slightly longer than dorsal apex. Basal sclerite broad, semicircular.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southeastern Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for high, referring to the elevation at the type locality, Las Alturas in Costa Rica.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: Las Alturas, 8.95°N, 82.83°W, v.1992, P. Hanson, Malaise trap, 1500 m (LACM) [LACM ENT 013051].

Apocephalus aquilonius new species

(Figs. 57, 86)

REMARKS. This species, along with *A. horridus* Borgmeier and *A. wirthi* Borgmeier, is one of only three *A. lanceatus*-subgroup species found in North America. One species, *A. wirthi*, has a relatively narrow frons (like *A. aquilonius*) but lacks supra-antennal setae (Fig. 88), whereas *A. aquilonius* has prominent, large supra-antennal setae (Fig. 86). The other species, *A. horridus*, has a broad frons with supra-antennal setae that are extremely close together (Fig. 87), whereas *A. aquilonius* has a narrower frons with supra-antennal setae that are closer to the lower interfrontal setae (Fig. 86).

DESCRIPTION. Body length 1.05–1.55 mm. Frons dark brown. Frontal ratio 1.16. Flagellomere 1 brown, pyriform. One pair of distinct supra-antennal setae present. Palpus yellowish-brown. Scutum brown. Scutellum brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae three times length and thickness of anterior pair. Pleuron light brown. Mean costal ratio 0.47. Halter yellowish-brown. Apex of hind femur without anterior or posterior dark spot. Tergite 1 light brown; tergites 2–5 dark brown, light brown medially, and along anterior and posterior margins; tergite 6 dark brown, light brown medially. Venter of abdomen yellowish-brown. Venter of abdominal segments 1–5 bare; segment 6 with broad, short sclerite, and row of long, thick setae. Ovipositor elongate, constricted at apical one-third; dorsal apex broadly pointed, with one pair of large, mediolateral setae at apical one-third and smaller posterolateral setae. Dorsal sclerotization even, except for slight lateral darkening at apical one-third. Ventral apex pointed, subequal in length to dorsal apex. Basal sclerite broad, lightly sclerotized.

GEOGRAPHICAL DISTRIBUTION. Southern Arizona and southern California.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for north, referring to the northerly distribution of *A. aquilonius* relative to most other *A. lanceatus*-subgroup species.

HOLOTYPE. ♀, USA: California: Los Angeles Co., Walker Ranch, Placerita Canyon Park, 34.38°N, 118.44°W, 2–16.x.1998, B. Brown, I.

Swift, Malaise trap (LACM) [LACM ENT 133867].

PARATYPES. USA: Arizona: Santa Cruz Co., Patagonia, 31.53°N, 110.77°W, 1♀, 5.viii.1995, B. Brown, E. Wilk, Malaise trap (LACM); California: Los Angeles Co., Walker Ranch, Placerita Canyon Park, 34.38°N, 118.44°W, 1♀, 8–17.ix.1998, 2♀, 2–16.x.1998, 1♀, 7.x.1999, B. Brown, I. Swift, Malaise trap (LACM, USNM).

Apocephalus arachnes new species

(Fig. 58)

REMARKS. This species can be recognized by the curved ventral setae on segment 6 and the long setae on the ovipositor (Fig. 58).

DESCRIPTION. Body length 2.0–2.3 mm. Frons dark brown. Frontal ratio 0.97. Flagellomere 1 light brown, elongate. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae one and one-half times length and about equal thickness of posterior setae of scutum. Posterior pair of scutellar setae three times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.58. Halter blackish-brown. Apex of hind femur with anterior and posterior dark spots. Tergite 1 blackish-brown; tergites 2–4 blackish-brown, light brown anteriorly, posteriorly, and medially; tergite 5 blackish-brown, light brown along posterior margin; tergite 6 dark brown, anterior two-fifths light brown. Venter of abdomen yellowish-brown to brown, darkening posteriorly. Venter of abdominal segments 1–5 bare; segment 6 with row of medium-sized, curved setae. Ovipositor elongate, apically expanded. Dorsal apex broadly rounded with lateral group of long setae in apical one-third. Dorsal sclerotization light, even, with lateral darkening at apical one-third. Ventral apex elongate, bluntly pointed, slightly longer than dorsal apex. Basal sclerite semicircular, with two anterior sclerites.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is from a Greek word for spider, referring to the setae of the ovipositor, which are long and resemble spider legs.

HOLOTYPE. ♀, COSTA RICA: Heredia, La Selva Biological Station, 10.43°N, 84.02°W, 1–15.iv.1993, ALAS, Malaise trap M/05/068 (INBC) [INBIOCRI001263950].

PARATYPES. COSTA RICA: Heredia, La Selva Biological Station, 10.43°N, 84.02°W, 1♀, 16.iii.1993, ALAS, Malaise trap M/15/046, 1♀, 15.v.1993, ALAS, Malaise trap M/06/037, 1♀, 30.vi.1995, ALAS, Malaise trap M/10/395 (INBC, LACM).

Apocephalus barbarus new species

(Fig. 59)

REMARKS. This species can be recognized by the thick, sinuous ventral setae on abdominal seg-

ment 6 and the distinctive form of the ovipositor, with its posterolateral lobes and narrowed dorsal apex (Fig. 59).

DESCRIPTION. Body length 1.2–1.3 mm. Frons brown. Frontal ratio 1.24. Flagellomere 1 yellowish-brown, posterior apex darker, oval, apically pointed. Supra-antennal setae absent. Palpus pale yellow. Scutum yellowish-brown. Scutellum yellowish-brown. Anterior pair of scutellar setae slightly thicker and longer than posterior setae of scutum. Posterior pair of scutellar setae two and one-half times length and three times thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.49. Halter brown, with narrow yellow marking. Apex of hind femur without anterior dark spot, but with posterior dark spot. Tergites brown; tergites 2–3 slightly lighter on anterior half. Venter of abdomen yellowish-brown, darkening posteriorly. Venter of abdominal segments 1–5 bare; segment 6 with lateral sclerites with thick, sinuous setae. Ovipositor posteriorly expanded. Dorsal apex narrow, pointed, without dorsal setae; with posterolateral lobes bearing four large setae. Dorsal sclerotization light, even, with clear area at apical one-third. Ventral apex narrow, bluntly pointed, subequal in length to dorsal apex. Basal sclerite triangular, extended posteriorly as far as ventral apex.

GEOGRAPHICAL DISTRIBUTION. Costa Rica and Colombia.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for strange, referring to the unusual shape of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 15.iv.1993, ALAS, Malaise trap M/01/064 (INBC) [INBIOCRI001264148].

PARATYPES. COLOMBIA: Magdalena: PNN Tayrona, Cañaveral, 11.33°N, 74.03°W, 2 ♀, 14–30.viii.2000, R. Henriquez, 30 m, Malaise trap CAP-568 (LACM, UNCB). COSTA RICA: Guanacaste: Santa Rosa National Park, 10.95°N, 85.62°W, 1 ♀, 18.x–8.xi.1986, I. Gauld, D. Janzen, Malaise trap SE-6-C (LACM).

Apocephalus brevitergum new species

(Figs. 60, 89)

REMARKS. This species can be recognized easily by the shortened abdominal tergite 3 (Fig. 89).

DESCRIPTION. Body length 1.58–2.18 mm. Frons dark brown. Frontal ratio 1.06. Flagellomere 1 light brown, pyriform. Supra-antennal setae absent. Palpus light brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.55. Halter dark brown. Apex of hind femur with anterior and posterior dark spots. Tergite 1 brown, yellowish-brown anteriorly, posteriorly, and medially; tergites 2, 4–5 blackish-brown, light brown anteriorly, posteriorly,

and medially; tergite 3 brown, as short as tergite 1 and slightly raised, sometimes light brown anteriorly; tergite 6 blackish-brown, light brown in anterior half. Venter of abdomen yellowish-brown, segment 6 brown. Venter of abdominal segments 1–3 bare; segment 4 bare or with few setae; segment 5 with few setae; segment 6 with complete row of long, relatively thick setae. Ovipositor elongate, broadly rounded at dorsal apex (Fig. 60); with group of three lateral setae at apical one-third. Dorsal sclerotization light, except lateral darkening at midlength, extending posteromedially. Ventral apex of ovipositor narrowed, bluntly pointed, much longer than dorsal apex. Basal sclerite short, with medial posterior projection; with pair of anterior triangular sclerites.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Amazonia.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for short tergum, referring to the abbreviated tergite 3 of the female abdomen.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: 24 km W Pan American Highway [= 24 km W Piedras Blancas], 8.77°N, 83.40°W, iii–iv.1989, Malaise trap, P. Hanson, I. Gauld (LACM) [LACM ENT 050920].

PARATYPES. BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 3 ♀, 8–15.iv.1992, 9 ♀, 6–17.vii.1992, 1 ♀, 4–13.xi.1992, J. Vidal (INPA, LACM, MCZC, NHRS, SEMC, USNM). COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 2 ♀, 1–15.iv.1993, ALAS, Malaise trap M/11/074, 1 ♀, 4.iv.1994, ALAS, Malaise trap M/09/387, 2 ♀, 3.iv.2000, ALAS, Malaise trap M/19/745 (INBC, LACM); Puntarenas: Coopemarti, 8.63°N, 83.47°W, 3 ♀, ii.1991, P. Hanson, Malaise trap, 30 m (LACM), 5 km W Piedras Blancas, 8.77°N, 83.28°W, 1 ♀, i.1993, P. Hanson, Malaise trap, 100 m (LACM), 24 km W Piedras Blancas, 8.77°N, 83.40°W, 2 ♀, iii–iv.1989, 1 ♀, i.1992, P. Hanson, Malaise trap, 200 m (LACM, MUCR), 23 km N Puerto Jimenez, 8.67°N, 83.45°W, 2 ♀, vi.1991, P. Hanson, Malaise trap, 10 m (LACM), 3 km SW Rincon, 8.68°N, 83.48°W, 1 ♀, iii–v.1991, P. Hanson, Malaise trap, 10 m (LACM). PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 2 ♀, 1–7.iv.1993, J. Pickering, Malaise trap #936 (LACM, MIUP).

Apocephalus carcinus new species

(Fig. 61)

REMARKS. This species is instantly recognizable because of the unusual, thickened posteromedial setae of the ovipositor (Fig. 61).

DESCRIPTION. Body length 1.38–2.00 mm. Frons brown. Frontal ratio 1.14. Flagellomere 1 brown apically, lighter brown basally, oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown. Scutum yellowish-brown. Scutellum light brown. Anterior pair of scutellar setae one and one-half times length and twice thickness of pos-

terior setae of scutum. Posterior pair of scutellar setae slightly greater in length and four times thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.54. Halter dark brown, with narrow yellow marking. Apex of hind femur without anterior dark spot, but with posterior dark spot. Tergite 1 dark brown, posterior margin yellowish-brown; tergite 2 yellowish-brown, dark brown laterally with two dorsal, dark brown spots; tergites 3–4 dark brown laterally, lightening to yellowish-brown medially; tergites 5–6 yellowish-brown in anterior half, slightly darker in posterior half. Venter of abdomen yellowish-brown. Venter of abdominal segments 1–5 bare; segment 6 with row of long, thick setae. Ovipositor elongate, composed of two segments: basal lightly sclerotized area, and posterior triangular, moderately sclerotized area. Triangular area with posterolateral pair of thick setae, and posteromedial pair of flattened spatulate setae. Dorsal apex pointed, strongly curved ventrally, with pair of curved setae. Ventral apex pointed, subequal in length to dorsal apex. Basal sclerite small, short, narrow. Ovipositor without ventrolateral setae.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Amazonian Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is from a Greek word, *karkinos*, for crab, referring to the clawlike shape of the enlarged setae of the ovipositor.

HOLOTYPE. ♀, BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 6–17.vii.1992, J. Vidal, Arm. Cola 18-1 m [should be 1-B-1 m] (INPA) [LACM ENT 031150].

PARATYPES. BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 3♀, 8–15.iv.1992, J. Vidal, Arm. Cola 1-B-1 m, 1-B-20 m, Arm. Oleo 1-A-1 m, 4♀, 6–17.vii.1992, J. Vidal, Arm. Cola 1-B-1 m (INPA, LACM).

Apocephalus cinereus new species

(Fig. 62)

REMARKS. This species can be recognized by its gray color and the form of the ovipositor (Fig. 62).

DESCRIPTION. Body length 1.5 mm. Frons brown. Frontal ratio 1.05. Flagellomere 1 orange-brown, pyriform. One pair of distinct supra-antennal setae present. Palpus light brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae one and one-half times length and thickness of posterior setae of scutum. Pleuron light brown. Mean costal ratio 0.5. Halter dark brown. Apex of hind femur with anterior and posterior dark spots. Tergites brown; tergites 2–3 slightly lighter on anterior half. Venter of abdomen gray. Venter of abdominal segments 1–5 bare; segment 6 with lateral groups of 2–3 setae. Ovipositor elongate, slightly constricted at midlength, with only small single posterolateral seta. Dorsal sclerotization even except for lateral darkening and central clear area.

Ventral apex elongate, bluntly pointed. Basal sclerite lens-shaped, with medial transverse ridge.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Mexico.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for gray, referring to the color of the venter of the abdomen.

HOLOTYPE. ♀, MEXICO: Yerba Buena, 8.vi.1969, W. Mason, Malaise trap, 1980 m (LACM) [LACM ENT 004005].

Apocephalus clarilocus new species

(Fig. 63)

REMARKS. This species is similar to *A. albiapex* but can be readily distinguished by its longer preapical setae dorsally on the ovipositor (Fig. 63).

DESCRIPTION. Body length 2.05–2.18 mm. Frons dark brown. Frontal ratio 1.17. Flagellomere 1 brown, anterior with broad, lighter colored band; sensillae large and whitish, oval, apically pointed. One pair of distinct supra-antennal setae present. Palpus yellowish-brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae one and one-half times length and about equal thickness of posterior setae of scutum. Posterior pair of scutellar setae two and one-half times length and three times thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.54. Halter dark brown. Apex of hind femur without anterior dark spot, but with posterior dark spot. Tergites blackish-brown, with tergites 1–5 yellowish-brown to light brown medially; tergites 1–3 light brown anteriorly and posteriorly; tergites 4–5 with or without light brown anterior or posterior margins; tergite 6 with anterior half light brown. Venter of abdomen yellowish-brown, darkening posteriorly. Venter of abdominal segments 1–3 bare; segment 4 with one pair of long setae; segment 5 with one to two pairs of long setae; segment 6 with row of thicker setae. Ovipositor elongate, broadly rounded at dorsal apex; with one long, apicolateral seta, and few smaller apical setae. Dorsal sclerotization interrupted by clear area at apical one-third. Ventral apex longer than dorsal apex, bluntly pointed. Basal sclerite lens-shaped with anterior and posterior medial projections.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for clear place, referring to the light-colored tip of flagellomere 1 of the antennae.

HOLOTYPE. ♀, COSTA RICA: Heredia, La Selva Biological Station, 10.43°N, 84.02°W, 15.ii–1.iii.1993, ALAS, Malaise trap M/08/023 (INBC) [INBIOCRI001263945].

PARATYPES. ♀, COSTA RICA: Heredia, La Selva Biological Station, 10.43°N, 84.02°W, 1♀, 16.iii.1993, ALAS, Malaise trap M/15/046, 1♀, 1–15.v.1993, ALAS, Malaise trap M/10/104, 2♀, 3.ii.1994, ALAS, Malaise trap M/06/347 (INBC, LACM).

Apocephalus commensuratus new species

(Fig. 64)

REMARKS. This species can be recognized by the distinctive, evenly sclerotized ovipositor, which lacks darker markings (Fig. 64).

DESCRIPTION. Body length 1.88 mm. Frons brown. Frontal ratio 1.27. Flagellomere 1 orange, oval. Absent or only slightly larger than frontal setulae. Palpus yellow. Scutum brown. Scutellum yellow. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae four times length and thickness of anterior pair. Pleuron yellow. Mean costal ratio 0.51. Halter dark brown. Apex of hind femur without anterior or posterior dark spot. Tergites 1–5 yellowish-brown, dark brown laterally; tergites 4–5 mostly dark brown, yellowish-brown medially; tergite 6 yellowish-brown. Venter of abdomen yellow. Venter of abdominal segments 1–5 bare; segment 6 with row of long setae. Ovipositor elongate, dorsal apex bluntly pointed. Apical one-half of ovipositor with short, dense setae. Dorsal sclerotization relatively even, with clear area at midlength. Ventral apex elongate, bluntly pointed, extending slightly farther than dorsal apex. Basal sclerite short, broad. Venter of ovipositor with short, dense setae, similar to dorsum.

GEOGRAPHICAL DISTRIBUTION. Amazonian Ecuador and Peru.

DERIVATION OF SPECIFIC EPITHET. The name is a Latin word for equality, referring to the homogeneous sclerotization of the dorsum of the ovipositor.

HOLOTYPE. ♀, ECUADOR: Napo: Yasuni National Park, PUCE Station, 0.63°S, 76.6°W, 3–20.xi.1998, T. Pape, B. Viklund, Malaise trap (LACM) [LACM ENT 110283].

PARATYPES. ECUADOR: Napo: Yasuni National Park, PUCE Station, 0.63°S, 76.6°W, 1♀, 3–20.xi.1998, T. Pape, B. Viklund, Malaise trap (QCAZ); Sucumbios: Sacha Lodge, 0.5°S, 76.5°W, 1♀, 20–30.ix.1994, P. Hibbs, Malaise trap, 270 m (LACM). PERU: Madre de Dios: Cocha Cashu Station, 1♀, 23–30.viii.1986, D.C. Darling, Malaise trap, 380 m (LACM).

Apocephalus epicaustus new species

(Fig. 65)

REMARKS. This is a small species with the venter of the abdomen strikingly contrasting in color between the whitish-yellow anterior segments and dark gray posterior segments. The structure of the ovipositor (Fig. 65) is also distinctive.

DESCRIPTION. Body length 1.15–1.45 mm. Frons dark brown. Frontal ratio 1.09. Flagellomere 1 brown apically, lighter brown basally, oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum brown (slightly lighter than tergites and halter). Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of

scutellar setae twice length and thickness of anterior pair. Pleuron light brown to brown. Mean costal ratio 0.49. Halter brown, with narrow yellow marking. Apex of hind femur without anterior dark spot, but with posterior dark spot. Tergites brown; tergites 1–2 light brown anteriorly, posteriorly, and medially; tergites 3–5 light brown along posterior margin; tergite 6 brown; specimen from Ecuador dark brown instead of brown. Venter of abdomen whitish-yellow anteriorly, dark gray posteriorly. Venter of abdominal segments 1–5 bare; segment 6 with few medium-sized setae. Ovipositor elongate, expanded apically; broadly rounded at dorsal apex; with few shorter setae at apical one-third. Dorsal sclerotization dark on basal two-thirds, with relatively clear area separating apical, lateromedial darkening. Ventral apex longer than dorsal apex, bluntly pointed. Basal sclerite oval, with anterior projection.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Ecuador.

DERIVATION OF SPECIFIC EPITHET. The name is from a Greek word, *epikaustos*, for burned at the tip, referring to the dark color of the apex of the abdomen.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1–15.iv.1993, ALAS, Malaise trap M/11/074 (INBC) [INBIOCRI001263963].

PARATYPES. COSTA RICA: Alajuela: San Pedro de la Tigra, 10.37°N, 83.92°W, 1♀, ii.1990, P. Hanson, Malaise trap, 200 m (LACM); Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 2♀, 15.iii.1993, ALAS, Malaise trap M/09/040, 3♀, 2.iv.1993, ALAS, Malaise trap M/05/52, M/11/58, 14♀, 1–15.iv.1993, ALAS, Malaise trap M/01/064, M/11/074, 2♀, 2.v.1993, ALAS, Malaise trap M/09/88, 6♀, 19.v.1993, ALAS, Malaise trap M/09/103, M/11/105, 1♀, 15.vi–1.vii.1993, ALAS, Malaise trap M/10/144, 1♀, 15.vii.1993, ALAS, Malaise trap M/11/161, 1♀, 16.ix.1993, ALAS, Malaise trap M/11/217, 1♀, 15.xi.1993, ALAS, Malaise trap M/11/245, 2♀, 15.ii.1994, ALAS, Malaise trap M/13/359, 3♀, 4.iv.1994, ALAS, Malaise trap M/11/389, 1♀, 15.i.1996, ALAS, Malaise trap M/01/543, 1♀, 31.v.1996, ALAS, Malaise trap M/01/651, 5♀, 3.iv.2000, ALAS, Malaise trap M/19/745 (INBC, LACM, MCZC, MUCR, MZSP, NHRS, SEMC, USNM); Limón: 4 km NE Bribri, 9.63°N, 82.22°W, 1♀, iv–vi.1990, P. Hanson, Malaise trap, 50 m (LACM); Puntarenas: 3 km SW Rincon, 8.68°N, 83.48°W, 1♀, iii–iv.1991, P. Hanson, Malaise trap, 10 m (LACM). ECUADOR: Pichincha: 17 km E Santo Domingo, Tinalandia, 1♀, 6–13.v.1987, B.V. Brown, clubhouse windows, 710 m (LACM). PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 1♀, 24–31.vii.1996, J. Pickering, Malaise trap #6730 (MIUP).

Apocephalus euryterminus new species

(Fig. 66)

REMARKS. This species can be recognized by the extremely broad ventral apex of the ovipositor (Fig. 66). Other species with the ovipositor apically broadened are *A. epicautus* (Fig. 65) and *A. latiapex* new species (Fig. 74), but both of these have the paired tips of the ventral apex closer together than in *A. euryterminus*, in which they are far apart.

DESCRIPTION. Body length 1.5 mm. Frons dark brown. Frontal ratio 1.15. Flagellomere 1 light brown, apex and posterior slightly darker; sensillae large, oval, apically pointed. Supra-antennal setae absent. Palpus yellowish-brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae one and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae two and one-half times length and three times thickness of anterior pair. Pleuron yellowish-brown. Costal ratio 0.54. Halter dark brown. Apex of hind femur without anterior dark spot, but with small posterior dark spot. Abdominal tergites yellow with anterolateral brown markings. Venter of abdominal segments 1–5 bare; segment 6 with row of thick setae. Ovipositor elongate, apically expanded, broadly rounded at dorsal apex, with few short posterolateral setae. Dorsum evenly sclerotized, darker near apex. Ventral apex broad, truncate, slightly longer than dorsal apex. Basal sclerite short, extremely broad.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is based on a Greek word, *eury*s, and a Latin word, *terminus*, together meaning broad end. It refers to the shape of the apex of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: Coopemarti, 8.63°N, 83.47°W, ii.1991, P. Hanson, Malaise trap, 30 m (LACM) [LACM ENT 004675].

Apocephalus flexiseta new species

(Fig. 67)

REMARKS. This species can be recognized by the relatively small body size, paired ventral abdominal setae, and the two lateral, bent setae of the ovipositor (Fig. 67).

DESCRIPTION. Body length 1.34–1.64 mm. Frons dark brown. Frontal ratio 1.1. Flagellomere 1 light brown, oval. Supra-antennal setae absent to one pair of distinct supra-antennal setae present. Palpus yellowish-brown. Scutum yellowish-brown to brown. Scutellum brown to dark brown. Anterior pair of scutellar setae one and one-half times length and about equal thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and three times thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.51. Halter brown. Apex of hind femur without anterior dark spot, but with posterior dark spot. Tergites 1–

3 brown to dark brown; tergites 1–2 lightened anteriorly, posteriorly, and medially; tergite 3 lightened anteriorly, with or without lightening posteriorly or medially; tergites 4–5 with or without lightening anteriorly or posteriorly; tergite 6 lightened anteriorly. Venter of abdomen yellowish-brown, segment 6 gray. Venter of abdominal segments 1–3 bare; segments 4 and 5 with one pair of widely spaced setae; segment 6 with a few longer posterior setae. Ovipositor elongate, broadly rounded at dorsal apex, with one pair of large, apicodorsal, bent setae and one pair of ventrolateral, bent setae. Ventral apex of ovipositor narrowed, bluntly pointed, much longer than dorsal apex. Basal sclerite short, lens-shaped.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Amazonia.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for bent seta, referring to the prominent lateral setae of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: San José: Ciudad Colon, 9.92°N, 84.25°W, iii–iv.1990, P. Hanson, Malaise trap, 800 m (LACM) [LACM ENT 009953].

PARATYPES. BRAZIL: Amazonas: 60 km N Manaus, Reserva Campina, 2.67°S, 60.0°W, 23 ♀, 8–19.vi.1992, J. Vidal (INPA, LACM). COLOMBIA: Caquetá: PNN Chiribiquete, Puerto Abeja, 0.07°N, 72.43°W, 2 ♀, 29.x–12.xi.2000, J. Forero, Malaise trap, CAP-#951 (LACM, UNCB). COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1 ♀, 26.iv–1.v.1989, B. Brown, D. Feener, Malaise trap, treefall gap, CC 100 (LACM), 3 ♀, 16.ii–2.iii.1993, ALAS, Malaise trap M/05/20, M/07/022, 1 ♀, 16.iii.1993, ALAS, Malaise trap M/15/046, 1 ♀, 1–15.iv.1993, ALAS, Malaise trap M/06/069, 4 ♀, 15.iv–1.v.1993, ALAS, Malaise trap M/09/088, M/10/089, M/14/093, M/15/094, 5 ♀, 19.v.1993, ALAS, Malaise trap M/05/100, M/07/101, M/09/103, M/11/105, 2 ♀, 2.vi.1993, ALAS, Malaise trap M/15/121, 4 ♀, 15.vi–1.vii.1993, ALAS, Malaise trap M/04/139, M/08/142, 1 ♀, 14.viii.1993, ALAS, Malaise trap M/11/189, 3 ♀, 1.ix.1993, ALAS, Malaise trap M/02/193, M/12/202, M/15/261, 2 ♀, 15.xi.1993, ALAS, Malaise trap M/10/244, 1 ♀, 4.x.1993, ALAS, Malaise trap M/06/235, 1 ♀, 15.iii.1996, ALAS, Malaise trap M/10/599, 1 ♀, 15.iv.1996, ALAS, Malaise trap M/07/620, 1 ♀, 3.iv.2000, ALAS, Malaise trap M/19/745 (INBC, LACM, MCZC, NHRS, SEMC), 1 ♀, iv–v.1995, P. Hanson, Malaise trap (MUCR); Limón: 4 km NE Bribri, 9.63°N, 82.82°W, 4 ♀, xii.1989–iii.1990, 1 ♀, iv–vi.1990, P. Hanson, Malaise trap, 50 m (LACM), 7 km SW Bribri, 9.58°N, 82.88°W, 2 ♀, ix–xi.1989, P. Hanson, Malaise trap (LACM); Puntarenas: 24 km W Piedras Blancas, 8.77°N, 83.40°W, 1 ♀, xii.1990, P. Hanson, Malaise trap, 200 m (LACM), 3 km SW Rincon, 8.68°N, 83.48°W, 2 ♀, iii–iv.1991, P. Hanson, Malaise trap, 10 m (LACM, USNM); San José: Ciudad Colon, 9.92°N, 84.25°W, 1 ♀, ii.1990, 3 ♀, iii–iv.1990, 1 ♀, iv–

v.1990, P. Hanson, Malaise trap, 800 m (LACM), Zurquí de Moravia, 10.05°N, 84.05°W, 1♀, v.1994, 1♀, viii.1995, P. Hanson, Malaise trap, 1600 m (LACM). ECUADOR: Sucumbios: Sacha Lodge, 0.5°S, 76.5°W, 1♀, 13–23.vi.1994, P. Hibbs, Malaise trap, 270 m (LACM). PANAMA: Canal Zone: Barro Colorado Island, 9.15°N, 79.85°W, 1♀, 24–31.iii.1993, J. Pickering, Malaise trap #935 (LACM); San Blas: Nusagandi Reserve, 9.33°N, 79.0°W, 2♀, 16–23.iv.1994, J. Pickering, Malaise trap #2862 (LACM, MIUP).

Apocephalus fuscipex new species
(Fig. 68)

REMARKS. This species can be recognized by the color of flagellomere 1, the dark gray venter of the abdomen and the slightly down-turned apex of the ovipositor.

DESCRIPTION. Body length 1.38–1.5 mm. Frons dark brown. Frontal ratio 1.16. Flagellomere 1 orange basally, with dark anterior apex, oval, apically pointed. Supra-antennal setae absent. Palpus yellow. Scutum brown. Scutellum dark brown. Anterior pair of scutellar setae one and one-half times length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and three times thickness of anterior pair. Pleuron brown. Mean costal ratio 0.5. Halter dark brown. Apex of hind femur without anterior dark spot, but with posterior dark spot. Abdominal tergites dark brown, tergite 6 yellow anteriorly. Venter of abdomen gray. Venter of abdominal segments 1–4 bare; segment 5 with one pair of setae; segment 6 with short lateral sclerite and three long, thick setae on each side. Ovipositor lightly sclerotized, with clear transverse line at apical one-third; broadly pointed at apex and slightly downturned. Ventral apex narrower and longer than dorsal apex.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Amazonian Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for dark tipped, referring to the color of flagellomere 1 of the antennae.

HOLOTYPE. ♀, BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 6–17.vii.1992, J. Vidal, Arm. Cola 18–20 m (INPA).

PARATYPES. BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 2♀, 6–17.vii.1992, J. Vidal, Arm. Cola 10 m (INPA, LACM).

Apocephalus horridus Borgmeier
(Figs. 69–71, 87)

Apocephalus horridus Borgmeier, 1963:181–182, fig. 171.

Neodohrniphora arnaudi Borgmeier, 1966:140–141, figs. 107–109. Brown, 1988:313–314, fig. 131. Synonymized by Brown, 1997:4.

Borgmeieria arnaudi Prado, 1976:582, figs. 52–53.

HOLOTYPE. ♀, USA: California: Marin Co., Mill Valley, 10.ix.1948, H.B. Leech (examined; CASC) [LACM ENT 126024].

REMARKS. This species can be recognized by the extremely long, thick ventral setae on segment 6, as well as the structure of the head and ovipositor (especially the ventral, hook-shaped sclerites; Fig. 70). Its identification relative to other North American species is discussed under *A. aquilonius*, above.

DESCRIPTION. Body length 1.6–2.23 mm. Frons dark brown. Frontal ratio 0.94 (Fig. 87). Flagellomere 1 dark brown, slightly lighter than frons, pyriform. Supra-antennal setae absent to one pair of distinct supra-antennal setae present. Palpus orange to yellowish-brown. Scutum brown. Scutellum brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae three times length and twice thickness of anterior pair. Pleuron light brown. Mean costal ratio 0.45. Halter light brown, brown anteroapically. Apex of hind femur without anterior or posterior dark spot. Tergites dark brown. Specimens from Arizona with tergites light brown, laterally blackish; tergites 2–3 dark posteriorly. Venter of abdomen gray to brown. Venter of abdominal segments 1–5 bare; segment 6 with large, square sternite, with long, thick posterior setae. Ovipositor lightly sclerotized with darker posteromedial region, dorsally with two long setae (Fig. 69). Venter of ovipositor with pair of convergent hook-shaped sclerites. Basal sclerite semicircular.

GEOGRAPHICAL DISTRIBUTION. Western North America.

HOST. This species has been reared from workers of *Camponotus vicinus* (Mark Mankowski, Oregon State University, personal communication).

OTHER MATERIAL EXAMINED. CANADA: British Columbia: N shore Shuswap Lake, 50°59'N, 119°06'W, 1♂, 1♀, 22–31.viii.1987, J.E. O'Hara, Malaise trap, 400 m (LACM). USA: Arizona: Cochise Co., 5 mi. E Highway 81 on FSR 42, 31.97°N, 109.32°W, 1♂, 6–8.viii.1989, D. Pollock, Malaise trap (LACM), Basin Trail, 31.89°N, 109.23°W, 9♂, 1♀, 7–10.vi.1986, B. Brown, Malaise trap, 1♂, 8–10.vii.1987, B. Brown, T. Spanton, yellow pans, 1♂, 12–14.viii.1999, B. Brown, G. Kung, Malaise trap #1, 1950 m (LACM), 5 mi. SW Portal, Southwest Research Station, 1♂, 10.vi.1965, V. Roth, Malaise trap (LACM), 3♂, 23.v–5.vi.1967, C. Sabrosky, Malaise trap (USNM), 26 km W Portal, Barfoot Park, 1♂, 7–10.vi.1986, B. Brown, T. Spanton, Malaise trap, 8400 ft. (LACM), Santa Cruz Co., Upper White Rock Campground, Peña Blanca Lake, 31.39°N, 111.08°W, 1♀, 12–16.viii.1993, B. Brown, pan traps, 1♀, 14.viii.1993, B. Brown, blacklight trap, 1♀, 18.ix.1997, B. Brown, G. Kung, J. Paldi, blacklight trap (LACM), Walker Canyon, 1♂, 11.viii.1989, D. Pollock, blacklight trap (LACM); California: Los Angeles Co., Walker Ranch, Placerita Canyon, 34.38°N, 118.44°W, 3♂, 1♀, 8–17.ix.1998, 2♀, 2–16.x.1998, 1♀, 16–28.x.1998, 1♂, 1♀, 28.x–18.xi.1998, 1♂, 1♀, 24.v.1999, B.

Brown, I. Swift, Malaise trap (LACM), Marin Co., Alpine Lake, 1♂, 7.vii.1970, D.D. Monroe, Malaise trap (CNCI), Santa Barbara Co., Sedgewick Ranch, 34.72°N, 120.03°W, 2♂, 1♀, 9–16.iv.1997, E. and M. Schlenger, Malaise trap, 1200 m (LACM), Tuolumne Co., 1.5 km E Tuolumne, 1♂, 15–26.vi.1986, T.G. Spanton, FIT, oak foothill forest, 750 m (LACM), 13 km NE Twain Hart, 2♂, 2♀, 15–26.vi.1986, B. Brown, T. Spanton, FIT, montane forest, 1950 m (LACM); Colorado: Jefferson Co., T15 R70W Sec. 31, 39.91°N, 105.26°W, 1♂, 1♀, 26–28.vii.1994, V. Scott (LACM); New Mexico: Catron Co., 2.4 km W Luna, 5♂, 3♀, 7–8.vii.1987, B.V. Brown, yellow pines, 3♂, 1♀, 7–8.vii.1987, T. Spanton, FIT, oak/pine/juniper, 2300 m (LACM); Oregon: Baker Co., 36 mi. SE Union, 1♂, 29.vi–5.vii.1975, E.J. Davis, Malaise trap baited with CO₂ (WSUC), Josephine Co., 10 mi. N Grants Pass, 1♂, 1♀, 3.vi–1.vii.1986, B. Brown, T. Spanton, FIT, oak/pine (LACM); Texas: Kerr Co., Kerrville, 1♀, 1.iv.1955, W.W. Wirth (USNM); Utah: Cache Co., Green Canyon, 1♀, 13–18.viii.1967, W.J. Hanson (EMUS); Washington: Ferry Co., 9 mi. S Republic, Sanpoil River, 1♂, 23.vii.1975, W.J. Turner, Malaise trap with dry ice (WSUC).

Apocephalus inaffectus new species

(Figs. 72, 91)

REMARKS. This small species is recognized by the ventrally bare abdominal segments 1–5 and the structure of the ovipositor (Fig. 72).

DESCRIPTION. Body length 1.5 mm. Frons brown. Frontal ratio 1.25. Flagellomere 1 yellow, oval, apically pointed. Supra-antennal setae absent. Palpus yellow. Scutum yellow. Scutellum brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Pleuron light brown. Mean costal ratio 0.51. Halter dark brown, with narrow yellow marking. Apex of hind femur with small, brown anterior and posterior dark spots. Tergite 1 dark brown, yellowish-brown medially; tergites 2–4 yellowish-brown medially in anterior half; posterior half dark brown; tergites 5–6 dark brown; anterior margin yellowish-brown. Venter of abdomen whitish, segment 6 dark brown. Venter of abdominal segments 1–5 bare; segment 6 with short lateral sclerite with four large setae on each side (Fig. 91). Ovipositor elongate. Dorsal apex broadly rounded, with one medium-sized posterolateral seta. Dorsal sclerotization even on basal one-half, with clear area at midlength, and triangular, evenly sclerotized posterior region. Ventral apex elongate, bluntly pointed, slightly longer than dorsal apex. Basal sclerite semicircular, extremely broad. Ovipositor with one long ventrolateral seta.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for simple, referring to the plain appearance of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 18.v.1993, ALAS, Malaise trap M/09/103 (INBC) [INBIOCRI002273559].

Apocephalus lanceatus Borgmeier

(Fig. 73)

Apocephalus lanceatus Borgmeier, 1925:195–196, figs. 24–25.

TYPES. 22 syntype ♀, BRAZIL: Paraná: Rio Negro, 24.i.1924, over *Camponotus rufipes* (examined; MZSP).

REMARKS. This species can be recognized by the bright yellow flagellomere 1, lack of supra-antennal setae, and the distinctive setation of the dorsum of the ovipositor (Fig. 73).

DESCRIPTION. Body length 1.5–1.8 mm. Frons dark brown. Frontal ratio 1.11. Flagellomere 1 yellow, oval, apically pointed. Supra-antennal setae absent. Palpus yellow. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae slightly thicker and longer than posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.52. Halter blackish-brown. Apex of hind femur with anterior and posterior dark spots. Tergite 1 yellow, dark posterolaterally; tergite 2 yellow, dark laterally and with mediolateral macula; tergites 3–5 dark brown; tergite 6 anteriorly yellow and posteriorly dark brown. Venter of abdomen yellow. Venter of abdominal segments 1–3 bare; segments 4 and 5 with scattered long setae; segment 6 with posterior row of long setae. Ovipositor expanded slightly at midlength, rounded apex. Dorsum of ovipositor with small group of lateral setae at apical one-third. Venter of ovipositor converging to blunt point, with pair of small triangular darkenings. Basal sclerite short, with anterior pair of triangular sclerites.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southeastern Brazil.

HOST. The types were collected at a nest of *Camponotus rufipes*.

Apocephalus latiapex new species

(Fig. 74)

REMARKS. This species can be recognized by the broad apical one-third of the ovipositor (Fig. 74). Unlike the similar *A. euryterminus*, the ventral apex of the ovipositor of *A. latiapex* is pointed.

DESCRIPTION. Body length 1.25–1.35 mm. Frons dark brown. Frontal ratio 1.25. Flagellomere 1 light brown, oval. Supra-antennal setae absent. Palpus light brown. Scutum light brown. Scutellum brown. Anterior pair of scutellar setae twice length and thickness of posterior setae of scutum. Posterior pair of scutellar setae one and one-half times length and twice thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.49. Halter

brown. Apex of hind femur without anterior or posterior dark spot. Tergite 1 brown, yellowish-brown anteriorly and posteriorly; tergites 2–3 brown, with anterior half and posterior margin light brown; tergites 4–5 brown, slightly lighter medially, anterior and posterior margins light brown; tergite 6 with anterior half light brown, posterior half dark brown. Venter of abdomen light brown. Venter of abdominal segments 1–5 bare; segment 6 with lateral sclerites, each bearing four to five long, thick setae. Ovipositor elongate, constricted at mid-length, expanded posteriorly. Dorsal apex broadly pointed, with three long mediolateral setae. Dorsal sclerotization of basal portion even, posteriorly with dark transverse band. Ventral apex broad, bluntly pointed, slightly longer than dorsal apex. Basal sclerite short, broad.

GEOGRAPHICAL DISTRIBUTION. Costa Rica and Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for broad tip, referring to the shape of the apex of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 15.iv.1993, ALAS, Malaise trap M/09/072 (INBC) [INBIOCRI002272651].

PARATYPES. BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 1♀, 6–17.vii.1992, J. Vidal (LACM). COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1♀, 1.iii.1994, ALAS, Malaise trap M/10/368 (LACM).

Apocephalus medius new species

(Fig. 75)

REMARKS. This species is extremely similar to *A. platycauda* new species (Fig. 76), a species with which it frequently co-occurs. In *A. medius*, the ovipositor has a narrower dorsal sclerotization, and the ventral apex is much narrower (Fig. 75). Also, flagellomere 1 is light brown, slightly smaller, and less flattened.

DESCRIPTION. Body length 1.75–2.95 mm. Frons dark brown. Frontal ratio 1.28. Flagellomere 1 light brown, elongate. One to two pairs of distinct supra-antennal setae present. Palpus light brown. Scutum light brown. Scutellum blackish-brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.55. Halter blackish-brown, with narrow light brown marking. Apex of hind femur without anterior or posterior dark spot. Tergites 1–2 blackish-brown, lighter anteriorly, posteriorly, and medially; tergite 3 light brown to brown, blackish-brown laterally; tergites 4–5 blackish-brown, with or without lightening anteriorly, posteriorly, or medially; tergite 6 light brown anteriorly, dark brown posteriorly. Venter of abdomen yellowish-brown anteriorly, grayish-brown posteriorly. Venter of abdominal segments 1–2

bare; segments 3–5 with one to two pairs of long, black setae (setae sometimes not in pairs); segment 6 with row of longer, thicker setae. Ovipositor elongate, broadly rounded at apex, with few, relatively short setae posterolaterally. Dorsally with light basal sclerotization, round clear area at apical one-third, and medial darkenings at apex. Dorsoapical one-third of ovipositor with raised median ridge (sometimes difficult to see). Ventral apex elongate, bluntly pointed; much longer than dorsal apex. Basal sclerite short, broad.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Amazonian Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for middle, referring to the median ridge of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: 24 km W Piedras Blancas, 8.77°N, 83.40°W, vii–ix.1990, P. Hanson, Malaise trap, 200 m (LACM) [LACM ENT 013088].

PARATYPES. BRAZIL: Amazonas: Estiro do Equador, 4.47°S, 71.50°W, 1♀, x.1979, M. Alvaranga (MZSP); Manaus, Reserva Ducke, 3.13°S, 60.02°W, 2♀, 8–15.iv.1992, 3♀, 6–17.vii.1992, J. Vidal (INPA, LACM), 60 km N Manaus, Reserva Campina, 2.67°S, 60.02°W, 1♀, 8–19.vi.1992, J. Vidal (INPA, LACM); Roraima: Ilha de Maracá, 3.37°N, 61.43°W, 1♀, 2–13.v.1987, J. Rafael, Malaise trap (LACM). COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1♀, 14.xii.1995, ALAS, Malaise trap M/02/520 (INBC); Puntarenas: Cerro Rincon, 8.52°N, 83.47°W, 1♀, iii.1991, P. Hanson, Malaise trap, 745 m (LACM), Coopemarti, 8.63°N, 83.47°W, 1♀, ii.1991, P. Hanson, Malaise trap, 30 m (LACM). PANAMA: Canal Zone: Barro Colorado Island, 9.15°N, 79.85°W, 6♀, 19.x.1984, D.H. Feener, #810, over *Camponotus abdominalis* (AMNH, LACM, USNM), 4♀, 7–14.vii.1993, J. Pickering, Malaise trap #974, 1♀, 28.vii–4.viii.1993, J. Pickering, Malaise trap #991, 1♀, 4–11.viii.1993, J. Pickering, Malaise trap #1668, 1♀, 11–18.v.1994, J. Pickering, Malaise trap #2424, 1♀, 14–21.viii.1996, J. Pickering, Malaise trap #6782 (LACM, MIUP).

Apocephalus platycauda new species

(Fig. 76)

REMARKS. This species is extremely similar to *A. medius* (Fig. 75) but has a broader apical sclerotization and ventral apex of the ovipositor (Fig. 76). Flagellomere 1 is larger and flatter, ranging in color from bright yellow to light brown.

DESCRIPTION. Body length 1.95–2.6 mm. Frons dark brown. Frontal ratio 1.09. Flagellomere 1 yellow to light brown, elongate. One pair of distinct supra-antennal setae present. Palpus light brown. Scutum light brown. Scutellum brown to dark brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae about two and

one-half times length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.55. Halter blackish-brown. Apex of hind femur without anterior dark spot, posterior dark spot may be present or absent. Tergite 1 blackish-brown, light brown anteriorly, posteriorly, and medially; tergites 2–3 light brown, blackish-brown laterally; tergites 4–5 blackish-brown, light brown anteriorly, posteriorly, and medially; tergite 6 with anterior half light brown, posterior half dark brown. Venter of abdomen yellowish-brown; segment 6 brown to blackish-brown. Venter of abdominal segments 1 and 2 bare; segments 3–4 with one pair of setae; segment 5 with one pair of setae; segment 6 with row of longer, thicker setae. Ovipositor elongate, broadly rounded at dorsal apex; with relatively short, posterolateral setae, and group of small setae slightly below midlength. Dorsal sclerotization interrupted by curved line of desclerotization posteriorly; with median and lateral darkened areas. Ventral apex longer than dorsal apex, bluntly pointed. Basal sclerite broad, short.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to Ecuador.

DERIVATION OF SPECIFIC EPITHET. The name is from a Greek word for broad, *platys*, and a Latin word for tail, *cauda*, referring to the shape of the ovipositor.

HOLOTYPE. ♀, COSTA RICA: Puntarenas: 3 km SW Rincon, 8.68°N, 83.48°W, iii–v.1991, P. Hanson, Malaise trap, 10 m (LACM) [LACM ENT 034790].

PARATYPES. COSTA RICA: Alajuela: 5 km W San Ramon, 10.06°N, 84.05°W, 2 ♀, i.1997, O. Castro, Malaise trap, 1200 m (LACM); Puntarenas: 10 km W Piedras Blancas, 8.75°N, 83.30°W, 2 ♀, iii–v.1989, P. Hanson, Malaise trap (LACM), 24 km W Piedras Blancas, 8.77°N, 83.40°W, 3 ♀, iii–iv.1989, 4 ♀, x.1990, 2 ♀, xii.1990, 1 ♀, iv–v.1991, 4 ♀, i.1992, P. Hanson, Malaise trap, 200 m (INBC, LACM, MCZC, MUCR, NHRS, SEMC, USNM), 3 km SW Rincon, 8.68°N, 83.48°W, 2 ♀, vi–viii.1989, 7 ♀, iii–v.1991, P. Hanson, Malaise trap, 10 m (INBC, LACM, MUCR). ECUADOR: Pichincha: 17 km E Santo Domingo, Tinalandia, 1 ♀, 16–13.v.1987, B.V. Brown, clubhouse windows, 710 m (LACM). PANAMA: Canal Zone: Barro Colorado Island, 9.17°N, 79.83°W, 1 ♀, 3–10.iii.1993, J. Pickering, Malaise trap #932, 10 ♀, 1–7.iv.1993, J. Pickering, Malaise trap #936, 2 ♀, 7–14.vii.1993, J. Pickering, Malaise trap #974, 1 ♀, 28.vii–4.viii.1993, J. Pickering, Malaise trap #991 (LACM, MIUP).

Apocephalus radiatus new species

(Figs. 77, 92)

REMARKS. This species can be recognized by the structure of the ovipositor (Fig. 77) and the distinctive ventral setation of abdominal segment 6 (Fig. 92).

DESCRIPTION. Frons brown. Frontal ratio 1.1.

Flagellomere 1 yellowish-brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum yellowish-brown. Scutellum light brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae three times length and thickness of anterior pair. Pleuron yellowish-brown. Mean costal ratio 0.5. Halter brown, with narrow yellow marking. Apex of hind femur without anterior dark spot, but with small posterior dark spot. Venter of abdominal segments 1–5 bare; segment 6 with small, round, lateral sclerite with two medium-sized setae and several anterior setulae. Ovipositor elongate, slightly expanded posteriorly. Dorsal apex broadly rounded, with one long posterolateral seta. Dorsal sclerotization light, relatively even, except lateromedial darkenings. Ventral apex elongate, broadly pointed, longer than dorsal apex. Basal sclerite broad, semicircular. Ovipositor with relatively short ventrolateral seta.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for shining, referring to the fact that this species was collected at a light.

HOLOTYPE. ♀, COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 11.xii.1997, ALAS, light L/00/262 (INBC) [INBI-OCRI002274905].

Apocephalus rotundus new species

(Fig. 78)

REMARKS. This small species can be recognized by the distinctively shaped ovipositor with its apicolateral groups of closely placed setae (Fig. 78).

DESCRIPTION. Body length 1 mm. Frons dark brown. Frontal ratio 1.29. Flagellomere 1 yellow, oval. Supra-antennal setae absent. Palpus yellow. Scutum yellowish-brown. Scutellum light brown. Anterior pair of scutellar setae slightly thicker and longer than posterior setae of scutum. Posterior pair of scutellar setae about two and one-half times length and thickness of anterior pair. Pleuron light brown. Mean costal ratio 0.48. Halter dark brown, with narrow yellow marking. Apex of hind femur with small, brown anterior and posterior dark spots. Tergite 1 yellow, dark posterolaterally; tergite 2 yellow, dark laterally and with mediolateral macula; tergites 3–5 dark brown, lighter anteriorly; tergite 6 anteriorly yellow and posteriorly dark brown. Tergites 2–5 with isolated long, lateral seta. Venter of abdomen gray. Venter of abdominal segments 1–5 bare; segment 6 with lateral groups of three stout setae arising from small sclerite. Ovipositor hourglass-shaped, broadly rounded at apex, with apicolateral groups of closely placed setae and apicomedial sclerotization. Ventral apex of ovipositor narrow, pointed. Basal sclerite rounded, extremely broad (similar to that of *A. radiatus*, above).

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Amazonian Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for round, referring to the shape of the apex of the ovipositor.

HOLOTYPE. ♀, BRAZIL: Amazonas: Manaus, Reserva Ducke, 3.13°S, 60.02°W, 8–15.iv.1992, J. Vidal, Arm. Cola 1-B-10 m (INPA) [LACM ENT 008187].

Apocephalus setimargo Borgmeier
(Figs. 79, 90)

Apocephalus setimargo Borgmeier, 1971:112–113, fig. 153.

HOLOTYPE. ♀, BRAZIL: Santa Catarina: Nova Teutônia, F. Plaumann (examined; MZSP) [LACM ENT 037944].

REMARKS. This species can be recognized by the long dorsal and ventrolateral setae of the ovipositor (Fig. 79) and the isolated, large lateral setae of the tergites (Fig. 90).

DESCRIPTION. Body length 1.8 mm. Frons yellow. Frontal ratio 1.21. Flagellomere 1 yellow, pyriform. Supra-antennal setae absent. Palpus yellow. Scutum yellow. Scutellum light brown. Anterior pair of scutellar setae equal in size to posterior setae of scutum. Posterior pair of scutellar setae three times length and twice thickness of anterior pair. Pleuron yellow. Mean costal ratio 0.5. Halter light brown. Apex of hind femur without anterior dark spot, but with small posterior dark spot. Tergite 1 yellow, dark posterolaterally; tergite 2 yellow, dark laterally and with mediolateral macula; tergites 3–5 dark brown, medially yellow; tergite 6 anteriorly yellow and posteriorly dark brown. Tergites 2–5 with long, isolated seta laterally. Venter of abdomen yellow. Venter of abdominal segments 1–5 bare; segment 6 with two lateral sclerites, each bearing 3–4 long setae. Ovipositor apically pointed with few short and one long seta. Venter of ovipositor with long lateral seta at apical one-third. Basal sclerite short.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in southeastern Brazil.

Apocephalus sincerus new species
(Fig. 80)

REMARKS. This species can be recognized by the relatively evenly sclerotized dorsum of the ovipositor, which lacks darkly sclerotized areas (Fig. 80).

DESCRIPTION. Body length 1.3 mm. Frons brown. Frontal ratio 1.41. Flagellomere 1 pale yellow, oval. Supra-antennal setae absent. Palpus yellow. Scutum yellow. Scutellum light brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae twice length and thickness of anterior pair. Pleuron yellow. Mean costal ratio 0.5. Halter dark brown, with narrow yellow marking.

Apex of hind femur without anterior dark spot, but with small posterior dark spot. Tergites yellow with brown lateral spots. Venter of abdomen yellow. Venter of abdominal segments 1–3 bare; segments 4 and 5 with single pair of widely separated setae; segment 6 with lateral pair of two setae and with large, lightly sclerotized sternite. Ovipositor elongate, lightly sclerotized, and unmarked dorsally. Venter of ovipositor with apex pointed, extended past dorsal apex. Basal sclerite diamond-shaped with long anterior process.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Amazonian Brazil.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for pure, a reference to the relatively plain ovipositor.

HOLOTYPE. ♀, BRAZIL: Amazonas, Manaus, Reserva Ducke, 3.13°S, 60.02°W, 6–17.vii.1992, J. Vidal, Arm. Cola, 1B-20 m (INPA) [LACM ENT 008395].

Apocephalus vicinus Borgmeier
(Fig. 81)

Apocephalus vicinus Borgmeier, 1925:188–189, fig. 20.

Apocephalus sagittarius Borgmeier, 1971:109–110, fig. 140, new synonymy.

TYPES. *A. vicinus*, BRAZIL: Rio de Janeiro: Petropolis, 4♀ syntypes, 10.ii, 7.iv, 14.v, 25.v.1923, B. Ronchi (examined; MZSP, MCZC).

Apocephalus sagittarius, BRAZIL: Santa Catarina: Nova Teutônia, 2♀ (holotype and paratype), F. Plaumann (examined; MZSP).

REMARKS. This species can be recognized by the relatively small ventral setae on abdominal segment 6, as well as the structure of the ovipositor, especially the presence of four larger dorsal setae at the apical one-third (Fig. 81).

In his key to *Apocephalus* species, Borgmeier (1971) separated his newly described *A. sagittarius* from *A. vicinus* by “frons brown; costa 0.54” (*A. vicinus*) versus “frons yellow; costa 0.50” (*A. sagittarius*). These characters vary among specimens, however, and examination of type material of both species shows that they are conspecific.

DESCRIPTION. Body length 1.94–2.47 mm. Frons brown. Frontal ratio 1.46. Flagellomere 1 light brown, round. One pair of distinct supra-antennal setae present. Palpus light brown. Scutum light brown. Scutellum light brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior pair of scutellar setae three times length and thickness of anterior pair. Pleuron light brown. Mean costal ratio 0.54. Halter brown, with narrow yellow marking. Fore and midcoxae of some specimens (e.g., LACM ENT 009054) with long (approximately as long as coxa), dense setae. Apex of hind femur with small, brown, anterior darkening; without posterior dark spot. Tergite 1 light brown; tergite 2 blackish-brown, light brown in anterior quarter, posteriorly,

and medially; tergites 3–4 blackish-brown, anterior and posterior margins light brown, with or without lightening medially; tergite 5 light brown, blackish-brown laterally, with or without lightening medially; tergite 6 light brown, with or without lightening anteriorly. Venter of abdomen yellowish-brown, darkening posteriorly. Venter of abdominal segments 1–5 bare; segment 6 with posterior row of long, thin setae. Ovipositor constricted slightly below midlength, pointed apically. Dorsum of ovipositor with lateral pair of medium-sized setae at apical one-third and several smaller, more apical setae. Ventral apex of ovipositor pointed. Basal sclerite short, broad, poorly defined.

VARIATION. Among the material of this species there are specimens of two morphological groups, with both groups co-occurring at Ciudad Colon, Costa Rica and Sacha Lodge, Ecuador. The first group, including the type material of *A. vicinus* and *A. sagittarius*, has short, regular setae on the fore and midcoxae, whereas the second group has long (about as long as the coxae), dense setae on the same segments. In other characters, the specimens are relatively uniform, so I treat them all as one species.

GEOGRAPHICAL DISTRIBUTION. Costa Rica to southeastern Brazil.

OTHER MATERIAL EXAMINED. COSTA RICA: Heredia: La Selva Biological Station, 10.43°N, 84.02°W, 1 ♀, 15.iv.1993, ALAS, Malaise trap M/06/69 (INBC); Limón: 4 km NE Bribri, 9.63°N, 82.82°W, 2 ♀, xii.1989–iii.1990, P. Hanson, Malaise trap, 50 m (LACM); Puntarenas: Coopemarti, 8.63°N, 83.47°W, 1 ♀, ii.1991, P. Hanson, Malaise trap, 30 m (LACM), 24 km W Piedras Blancas, 8.77°N, 83.4°W, 1 ♀, xii.1991, P. Hanson, Malaise trap (LACM); San José: Ciudad Colon, 9.92°N, 84.25°W, 2 ♀, ii.1990, 3 ♀, iii–iv.1990, P. Hanson, Malaise trap, 800 m (LACM, MUCR). ECUADOR: Sucumbios: Sacha Lodge, 0.5°S, 75.5°W, 1 ♀, 23.vi–3.vii.1994, P. Hibbs, Malaise trap, 270 m (LACM).

Apocephalus wirthi Borgmeier
(Figs. 82–84, 88)

Apocephalus wirthi Borgmeier, 1963:170–171, fig. 177.

HOLOTYPE. ♀, USA: Virginia: Falls Church, Holmes Run, 25.vi.1960, W.W. Wirth, light trap (examined; USNM) [LACM ENT 028309].

REMARKS. This species can be recognized by the dorsolateral pair of thick setae on the dorsum of the ovipositor (Figs. 82, 84). Its recognition relative to other North American species is discussed under *A. aquilonius*.

DESCRIPTION. Body length 1.6–1.8 mm. Frons dark brown. Frontal ratio 1.42. Flagellomere 1 brown, oval. Supra-antennal setae absent. Palpus yellowish-brown. Scutum yellowish-brown to brown. Scutellum yellowish-brown to brown. Anterior pair of scutellar setae about equal length and thickness of posterior setae of scutum. Posterior

pair of scutellar setae three times length and thickness of anterior pair. Pleuron yellowish-brown to brown. Mean costal ratio 0.48. Halter yellow. Apex of hind femur without anterior or posterior dark spot, but hind femur slightly darker posteriorly. Tergite 1 dark brown, medially shortened; tergites 2–3 dark brown; tergites 4–5 dark brown, light brown medially, tergite 6 dark brown, slightly lighter in anterior half. Venter of abdomen grayish-brown. Venter of abdominal segments 1–5 bare; segment 6 with broad sclerite and posterior row of long, thick setae that increase in size laterally. Ovipositor broadly triangular, with lateral pair of short, thick setae at apical one-third. Venter of ovipositor with pair of convergent hook-shaped sclerites. Basal sclerite semicircular (Fig. 83), extended posteriorly nearly as far as apex of ovipositor (Fig. 84).

GEOGRAPHICAL DISTRIBUTION. Eastern North America to Arizona.

OTHER MATERIAL EXAMINED. USA: Arizona: Cochise Co., 12.5 km S Sierra Vista, Ramsey Canyon, 1 ♀, 22–29.x.1986, 1 ♀, 26.xi–3.xii.1986, B. Brown, Malaise trap, 1700 m, oak/pine/juniper (LACM); Florida: Highlands Co., Lake Placid, Archbold Station, 1 ♀, 12–18.xii.1985, B. Brown, S. Marshall, FIT, scrub forest (LACM); Georgia: Clarke Co., Athens, 33.90°N, 83.27°W, 12–19.viii.1992, J. Pickering, Malaise trap #164 (LACM); Maryland: Prince George's Co., Camp Springs, 1 ♀, 9.vi.1979, 2 ♀, 3.vii.1979, 3 ♂, 2 ♀, 14.vi.1980, G.F. Hevel, at blacklight (USNM); Virginia: Falls Church, Holmes Run, 1 ♂, 11.viii.1960, W.W. Wirth, light trap (USNM).

KEY TO FEMALES

Key to Subgroups of the *Apocephalus pergandei*-group

- 1 Abdominal segment 6 with large, broad (over one-half width of segment, but often extending across entire segment), often posteriorly rounded, ventral sclerite (Note: the ventral sclerite can be light colored and sometimes difficult to see but can be detected by the smooth, unwrinkled surface relative to the surrounding membrane); segment 5 often with ventral sclerite; major constriction of abdomen posterior to segment 4; lateral corner of tergites 5–6 of many species with extremely long, thick setae; ovipositor various (Figs. 4–11, 19–43), but often with dorsal sculpturing (*A. pergandei*-subgroup) 2
- Abdominal segment 6 with, at most, small round or narrow sclerites; segment 5 usually without ventral sclerites; constriction of abdomen posterior to segment 5; setae of tergites 5–6 short, not large and bristlelike; ovipositor various (Figs. 44–84) *A. lanceatus*-subgroup
- 2 Venter of ovipositor with broad, laterally pointed apex; dorsal median and lateral carina present on ovipositor (Fig. 30); venter of abdominal segments 4–6 with large tergites and long, dense,

- thin setae (Fig. 17); posterolateral corner of tergites 5–6 with large, thick, bristlelike setae . . .
 . . . *A. reburus* new species [Colombia, Venezuela]
- Without this combination of characters, although some of these states are found in other species 3
- 3 Venter (and usually lateral regions) of abdominal segments 4–6 with long, often dense scattered setae (Figs. 12–16) *A. hispidus*-series
- Venter of abdomen with short setae, setae confined to the posterior margin of segments, or with setae confined to fewer segments
 *A. pergandei*-series

Key to *Apocephalus hispidus*-series

- 1 Venter of abdominal segment 6 with forked, posteriorly directed process originating at anterior portion of segment (Fig. 15); ventral apex of ovipositor much longer than dorsal (Fig. 9) . . . *A. aculeatus* Borgmeier [Brazil]
- Ventral process, if present, not forked; ventral apex of ovipositor not as in Fig. 9 2
- 2 Ventral apex of ovipositor broadly produced with lateral pointed apices (Fig. 10); venter of abdominal segment 6 with short, blunt setae (Fig. 16)
 *A. hystricosus* new species [Costa Rica; Panama]
- Ventral apex of ovipositor of different form; venter of abdominal segment 6 with longer, thicker setae 3
- 3 (2) Ovipositor concave dorsally, without dark medial area flanked by clear, membranous sections (Fig. 11)
 *A. vangus* new species [Costa Rica]
- Ovipositor not concave dorsally; in dorsal view, with dark medial area flanked by large, clear, membranous sections (Figs. 4–6) 4
- 4 (3) Ovipositor with apical, forked process (Fig. 8) *A. hippurus* new species [Ecuador]
- Ovipositor without such a process 5
- 5 (4) Venter of ovipositor lacking long anteroventral process; ovipositor relatively broad, short (Fig. 4)
 *A. amplexus* new species [Costa Rica]
- Venter of ovipositor with long, thin, anteroventral process (Fig. 7); ovipositor narrower, longer (Figs. 5–6) 6
- 6 (5) Medial section of ovipositor relatively narrow (Fig. 6); anteroventral process of abdominal segment 6 blunt, not recurved (Fig. 14) *Apocephalus hispidus* Borgmeier [Brazil, Costa Rica, Ecuador, Panama]
- Medial section of ovipositor broader (Fig. 5); anteroventral process of abdominal segment 6 pointed, anteriorly recurved (Fig. 13) . . .
 *A. frameatus* new species [southeastern USA]

Key to *Apocephalus pergandei*-series

- 1 Ovipositor strongly downturned in lateral view; apex strongly upturned (Fig. 28) . .
 *A. camponoti* Borgmeier [Brazil]
- Ovipositor straight in lateral view . . . 2
- 2 (1) Dorsum of ovipositor, at most, with smooth median carina or with median groove (Figs. 19–29) 3
- Dorsum of ovipositor with abrupt, medial, longitudinal carina (Figs. 30–43) . . . 11
- 3 (2) Ovipositor with expansion at midlength, more distal narrowing, and equal or greater expansion at apex (Figs. 25–26) . . . 4
- Ovipositor, if expanded at midlength, narrower at apex (Figs. 19–24, 29) 5
- 4 (3) Posterior expansion of ovipositor broader than anterior expansion (Fig. 26) . . .
 *A. disparicauda* Borgmeier [eastern North America]
- Posterior expansion of ovipositor subequal in breadth to anterior expansion (Fig. 25) *A. coquilletti* Malloch [eastern North America]
- 5 (3) Ovipositor long, narrow, parallel-sided, without prominent expansion (Fig. 19) . .
 *A. collatus* new species [Costa Rica]
- Ovipositor expanded somewhere along length (Figs. 20–24, 29) 6
- 6 (5) Ovipositor short, truncate, broadest at apex *A. concisus* new species [USA]
- Ovipositor longer, broadest anterior to apex (Figs. 21–24, 29) 7
- 7 (6) Apical one-half of ovipositor extremely narrow, parallel-sided (Fig. 29)
 *A. crucicauda* Borgmeier [Brazil]
- Apical one-half of ovipositor much less narrowed, tapering or expanded (Figs. 21–24) 8
- 8 (7) Ovipositor at midlength with broad, lateral, dorsally curved flaps (Fig. 23)
 *A. stauratus* new species [Guyana, Peru]
- Lateral expansions of ovipositor of different form (Figs. 21, 22, 24) 9
- 9 (8) Apical one-third of ovipositor curved ventrally and with prominent black lateral margins (Fig. 21)
 *A. cyathus* new species [Mexico–Brazil]
- Apical one-third of ovipositor not curved ventrally and without prominent black lateral margins 10
- 10 (9) Ovipositor with large, rounded central sclerite (Fig. 22)
 *A. glomeratus* new species [USA]
- Ovipositor of different form, without a large, separate central sclerite (Fig. 24) . .
 *A. planus* new species [Brazil]
- 11 (2) Ventral sclerite of ovipositor markedly produced dorsolaterally, clearly forming lateral surface of ovipositor at midlength (Fig. 42B,C) 12

- Ventral sclerite only slightly upturned, except at apex in some species; at least half of visible lateral surface of ovipositor formed by ventrolateral projection of dorsal sclerite (Fig. 42A) 17
- 12 (11) In lateral view, dorsolateral expansion of ventral sclerite abruptly thickened at midpoint of ovipositor (Fig. 42B), producing curved interruption of lateral margin in dorsal view (Figs. 35, 37) 13
- In lateral view, dorsolateral expansion of ventral sclerite not thickened abruptly; instead, smoothly continuous along length or expanded past midlength (Figs. 42C, 31, 32, 34, 36) 14
- 13 (12) Ovipositor narrowing toward apex (Fig. 35) *A. cuneatus* Borgmeier [Brazil, Costa Rica]
- Ovipositor broadly expanded until apical one-third (Fig. 37)
..... *A. opimus* new species [Costa Rica]
- 14 (12) Ovipositor expanded below midlength (Fig. 34) *A. bulbosus* new species [Costa Rica, Ecuador]
- Ovipositor expanded more basally (Figs. 31, 32, 36) 15
- 15 (14) Apex of dorsal lobe of ovipositor expanded, rounded, subequal in breadth to base (Fig. 31); flagellomere 1 light brown
..... *A. aequalis* new species [Costa Rica; Panama]
- Apex of dorsal lobe narrower than base (Figs. 32, 36); flagellomere 1 bright yellow 16
- 16 (15) Ovipositor broadly expanded (Fig. 36); apex of dorsal lobe with distinct black sclerites (Fig. 36, visible only in cleared specimens)
..... *A. fernandezii* new species [Colombia]
- Ovipositor narrow (Fig. 32); apex of dorsal lobe without sclerites
..... *A. astrictus* new species [Mexico]
- 17 (11) Lateral margin of lateral expansions greatly thickened; adjacent membranous area thin, linear (Fig. 41)
..... *A. sharkeyi* new species [Costa Rica]
- Lateral margin of lateral expansion not so thickened; adjacent membranous area rounder, broader (Figs. 33, 38-40, 43) ..
..... 18
- 18 (17) Lateral expansions extremely abrupt; dorsal apex of ovipositor with pair of divergent sclerites (Fig. 33)
..... *A. bispinosus* Borgmeier [Brazil]
- Lateral expansions not so abrupt; dorsal apex of ovipositor without divergent sclerites (Figs. 38-40, 43) 19
- 19 (18) Ovipositor dorsally with fine wrinkles; dorsal lobe greatly expanded in apical half, but narrowed again at apex (Fig. 40)
..... *A. rugosus* new species [Canada, USA]
- Ovipositor without dorsal wrinkles; dorsal

- lobe not abruptly expanded (Figs. 38, 39, 43) 20
- 20 (19) Ovipositor narrow; lateral expansions only slightly developed (Fig. 43)
..... *A. similis* Malloch [southwestern USA]
- Ovipositor broad; lateral expansions well developed (Figs. 38, 39)
..... *A. pergandei* Coquillett [North America]

Key to *Apocephalus lanceatus*-subgroup

- 1 Dorsal and ventral apex of ovipositor curve dorsally (Fig. 52) 2
 - Dorsal and ventral apex of ovipositor straight in lateral view or slightly curved ventrally 4
 - 2 (1) Curved portion of apex of ovipositor as long as depth of ovipositor (Fig. 52)
..... *A. anacurvus* new species [Brazil, Costa Rica]
 - Only tip of ovipositor dorsally curved ..
..... 3
 - 3 (2) Ventral setae of abdominal segments 4-5 long, thick, subequal to those of segment 6; ovipositor with relatively thicker setae near midline (Fig. 53)
..... *A. setiventris* Borgmeier [Brazil]
 - Ventral setae of abdominal segments 4-5 much shorter than those of segment 6; setae near midline of ovipositor thin (Fig. 54) *A. velutinus* Borgmeier [Brazil, Costa Rica, Guatemala, Panama]
 - 4 (1) Tergite 3 unusually short, straplike (Fig. 89) *A. brevitergum* new species [Brazil, Costa Rica]
 - Tergite 3 not short, subequal in length to tergites 4-5 5
 - 5 (4) Ovipositor as in Fig. 67, with two large, lateral setae that are bent at apical one-third to one-quarter; each side of venter of abdominal segment 6 with two (sometimes three) ventrolateral setae, the outermost of which is slightly thinner
..... *A. flexiseta* new species [Brazil, Colombia, Costa Rica, Ecuador, Panama]
 - Ovipositor with only one large lateral setae or tips of setae not bent; ventral setation of abdominal segment 6 various 6
 - 6 (5) Venter of abdominal segment 5, and usually 3-4, with at least one pair of short setae 7
 - Venter of abdominal segments 3-5 bare (occasional specimens have a single seta on one side of segment 5) 16
 - 7 (6) One pair of supra-antennal setae present, distinguished from small setulae of frons 8
 - Supra-antennal setae absent 12
- (Note: Some specimens will be equivocal—if a satisfactory answer is not reached, try the other lead in this couplet.)

- 8 (7) Flagellomere 1 brown with white tip, relatively small and rounded *A. albiapex* new species [Brazil, Costa Rica, Ecuador, Panama]
- Flagellomere colored differently, in some species enlarged, oval, apically pointed 9
- 9 (8) Ovipositor with relatively long posterolateral setae; ovipositor ventrally curved at apex (Fig. 68) *A. fuscipapex* new species [Brazil]
- Ovipositor with short, inconspicuous lateral setae (Figs. 56, 75, 76) 10
- 10 (9) Ventral setae of segment 6 separated into lateral groups; supra-antennal setae reclinate *A. altus* new species [Costa Rica]
- Ventral setae of segment 6 in continuous row; supra-antennal setae proclinate 11
- 11 (10) Dorsal apex of ovipositor relatively broad, flat (Fig. 76); ventral apex broad; flagellomere 1 bright yellow to light brown, larger and flatter *A. platycauda* new species [Costa Rica, Ecuador, Panama]
- Dorsal apex of ovipositor relatively narrow, with longitudinal ridge (Fig. 75); ventral apex relatively narrow; flagellomere 1 brown with lighter colored apex, smaller, less flattened *A. medius* new species [Brazil, Costa Rica, Panama]
- 12 (7) Ovipositor dorsolateral pairs of thick, short, preapical setae (Fig. 82); venter of ovipositor with large, shelflike, process of basal sclerite that extends almost as far posteriorly as tip of ovipositor (Fig. 84); ventral setae of segment 6 extremely long *A. wirthi* Borgmeier [USA]
- Dorsum of ovipositor with different setation; venter of ovipositor without prominent process; ventral setae shorter 13
- 13 (12) Flagellomere 1 elongate, pointed (as in Fig. 85), bright yellow 14
- Flagellomere 1 small, at most slightly elongate or oval, color various 15
- 14 (13) Ovipositor with long dorsolateral, curved setae (Fig. 58) *A. arachnes* new species [in part, specimens with ventral setae; Costa Rica]
- Ovipositor with shorter, dorsolateral setae (Fig. 73) *A. lanceatus* Borgmeier [Brazil]
- 15 (13) Ovipositor lacking prominent lateral setae (Fig. 80); flagellomere 1 uniformly light-colored *A. sincerus* new species [Brazil]
- Ovipositor with two pairs of prominent lateral setae (Fig. 63); flagellomere 1 brown with whitish apex *A. clarilocus* new species [Costa Rica]
- 16 (6) Clearly differentiated, bristlelike, supra-antennal setae present 17
- Supra-antennal setae usually absent; if present, extremely small, similar to frontal setulae 19
- 17 (16) Ventral setae of abdominal segment 6 relatively thin, subequal to medium-sized setae of dorsum of tergite 6 *A. vicinus* Borgmeier [Brazil, Costa Rica, Ecuador]
- Ventral setae of segment 6 enlarged and thick, clearly equal to or larger than largest setae on dorsum of tergite 6 18
- 18 (17) Supra-antennal setae close together, closer to each other than to ventral interfrontal setae; frons broad (Fig. 87) *A. horridus* Borgmeier [western North America]
- Supra-antennal setae farther apart, closer to ventral interfrontal setae than to each other; frons relatively narrow (Fig. 86) *A. aquilonius* new species [southwestern USA]
- 19 (16) Venter of all abdominal segments dark gray *A. cinereus* new species [Mexico]
- At least some abdominal segments yellowish 20
- 20 (19) Venter of abdominal segments 5–6 dark gray, in contrast to lighter-colored anterior segments *A. epicautus* new species [Costa Rica, Ecuador, Panama]
- Venter of at least abdominal segment 5 yellowish, like anterior segments 21
- 21 (20) Forecoxa with apicoventral ctenidia (Fig. 45) *A. ctenicoxa* new species [Brazil, Costa Rica, Ecuador]
- Forecoxa without ctenidia 22
- 22 (21) Ovipositor with posterolateral pair of long, thick setae and posterior pair of broad, heavily sclerotized processes that are medially directed at apex (Fig. 61) *A. carcinus* new species [Brazil]
- Ovipositor without such bizarre modifications 23
- 23 (22) Dorsum of ovipositor broadly and abruptly expanded before apex (Figs. 66, 74) 24
- Dorsum of ovipositor not abruptly expanded before apex 25
- 24 (23) Ventral apex of ovipositor truncate (Fig. 66) *A. euryterminus* new species [Costa Rica]
- Ventral apex of ovipositor broadly pointed (Fig. 74) *A. latiapex* new species [Brazil, Costa Rica]
- 25 (23) Ovipositor posteriorly and segment 6 ventrally with thick, black setae (Fig. 59); those of segment 6 sinuous at midlength *A. barbarus* new species [Colombia, Costa Rica]
- Ovipositor posteriorly without strong se-

	tae; venter of segment 6 with straight setae only	26
26 (25)	Posterodorsal region of ovipositor raised, with a medial ridge (Fig. 50)	
-	... <i>A. superatus</i> new species [Costa Rica]	
-	Posterodorsal region of ovipositor flat	27
27 (26)	Tergites 2-5 with single long lateral seta (Fig. 90)	28
-	At least one of tergites 2-5 with more than one large seta	29
28 (27)	Dorsal apex of ovipositor with long, lateral seta (Fig. 79)	
-	... <i>A. setimargo</i> Borgmeier [Brazil]	
-	Ovipositor with apical setae bunched together, relatively short (Fig. 78)	
-	... <i>A. rotundus</i> new species [Brazil]	
29 (27)	Flagellomere 1 large, oval, apically pointed and flattened (Fig. 85); large, strikingly marked dark and yellow species; thorax white with broad areas of contrasting dark brown; ovipositor with quadrate or triangular black sclerotization at apex; sclerite with anteriorly directed arms (Figs. 46, 47, 49)	30
-	Differing from the above description; flagellomere 1, if enlarged, inflated at apex; thorax relatively uniformly light brown in color; ovipositor without large black posteromedial sclerite with anteriorly directed arms	32
30 (29)	Ovipositor with apical sclerite extremely broad; apical setae relatively short, thick (Fig. 49)	
-	... <i>A. ponderosus</i> new species [Panama]	
-	Apical sclerite not as broad; setae thinner	31
31 (30)	Basal sclerite of venter of ovipositor extraordinarily elongate, attaining apex of ovipositor (Fig. 48)	
-	... <i>A. pluteus</i> new species [Venezuela]	
-	Basal sclerite of venter of ovipositor inconspicuous, short	
-	... <i>A. facetialis</i> Borgmeier [Brazil, Costa Rica, Ecuador, Panama, Peru]	
32 (29)	Apex of ovipositor truncate, rectangular (Fig. 64)	
-	... <i>A. commensuratus</i> new species [Ecuador, Peru]	
-	Apex of ovipositor more narrowed, triangular (Figs. 58, 72, 77)	33
33 (32)	Ventral setae on segment 6 curved; ovipositor with relatively long setae (Fig. 58)	
-	... <i>A. arachnes</i> new species [in part, specimens without ventral setae; Costa Rica]	
-	Ventral setae on segment 6 straight; ovipositor with relatively short setae (Figs. 72, 77)	34
34 (33)	Larger species with several relatively long ventral setae on abdominal segment 6 (Fig. 91)	
-	... <i>A. inaffectus</i> new species [Costa Rica]	
-	Smaller species with ventral setae restrict-	

ed to ventrolateral pair (Fig. 92)
... *A. radiatus* new species [Costa Rica]

BEHAVIOR

Females of *A. pergandei*-group species have only rarely been collected attacking hosts (records summarized in Table 1). Usually these attacks have occurred at disturbed nests or at baits placed in the field to attract hosts. On one occasion, we collected females of *A. facetialis* attacking workers of *Camponotus* sp. as they were fleeing a raid of the army ant *Eciton rapax* (see species treatment of *A. facetialis* for more details).

We have observed that females of all species are strong and extremely fast fliers (also mentioned by Pergande, 1901). They hover over ants, darting down to attempt oviposition, but there is no information on the location of egg placement. More than one parasitoid species can attack a single host species at a site (e.g., *A. pergandei*, *A. coquilletti*, and *A. concisus* attacking *C. pennsylvanicus* at a single tuna-baited card at Bennett Springs State Park, Missouri), but there is no information on how or whether they differentially use hosts.

Little is known about larval development and behavior other than Pergande's (1901) observations on *A. pergandei*. One adult fly emerged 17 days after decapitating its host.

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FIGURES

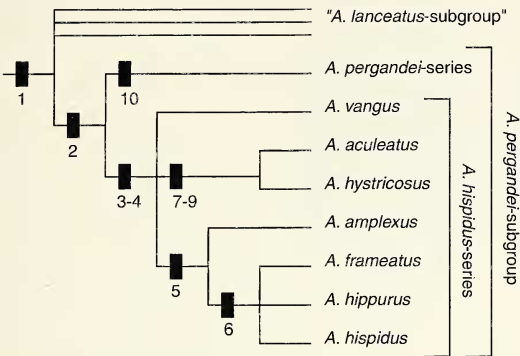


Figure 1 Cladogram of relationships among *Apocephalus pergandei*-group taxa

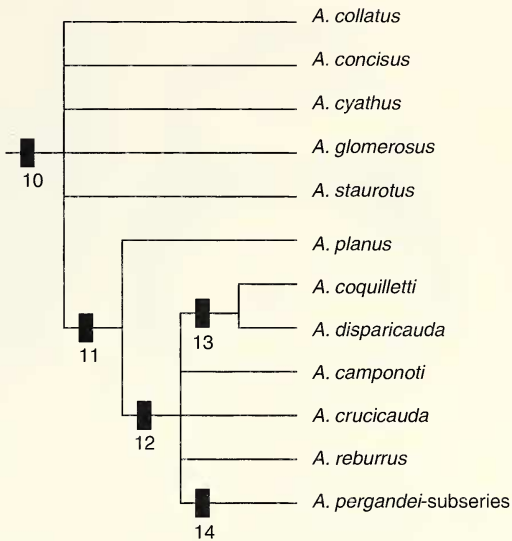


Figure 2 Cladogram of relationships among *Apocephalus pergandei*-series taxa

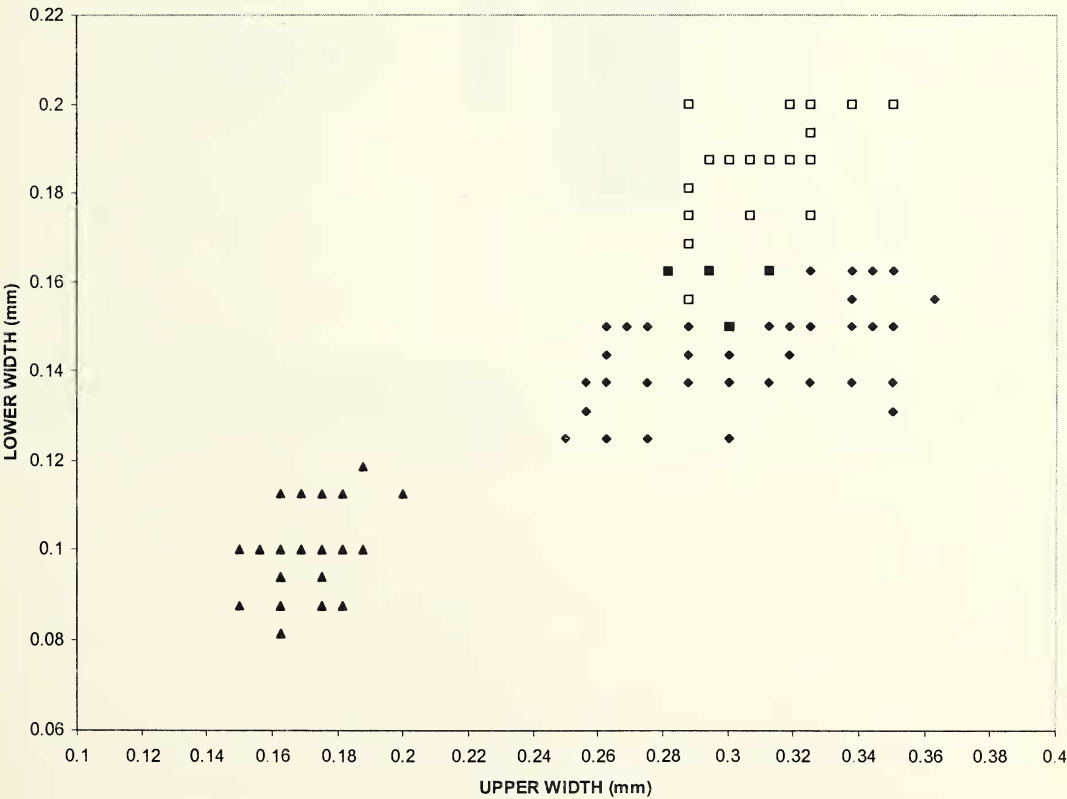
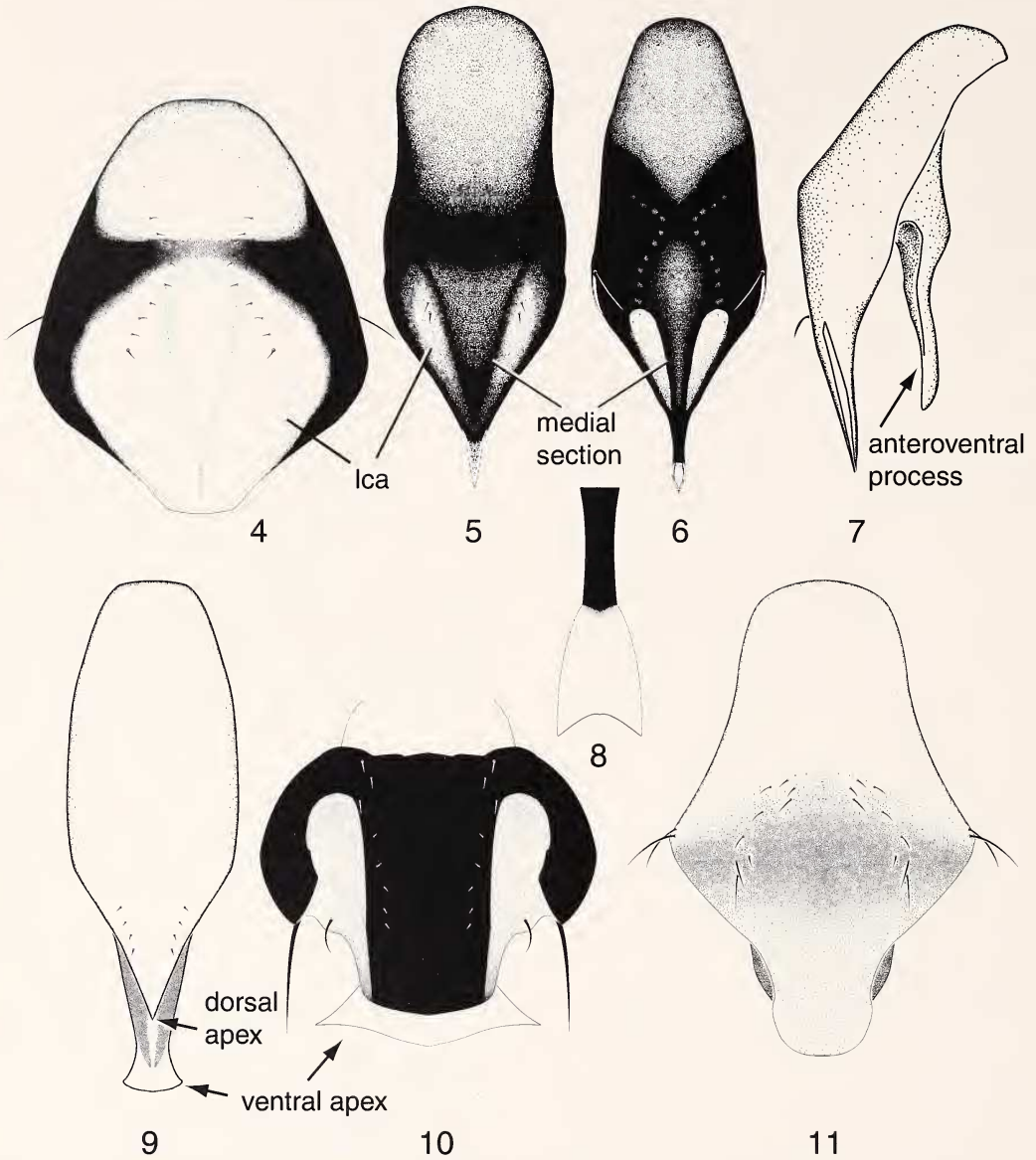
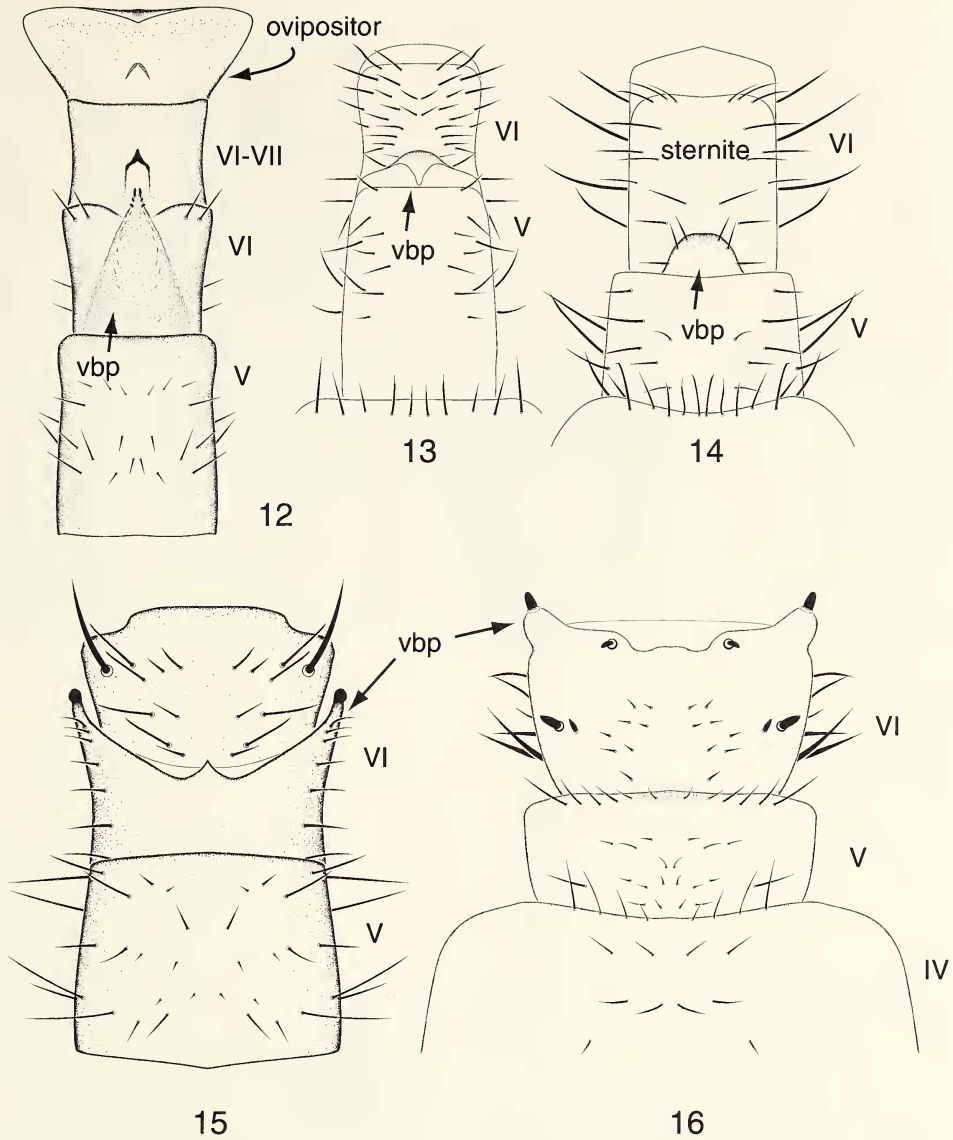


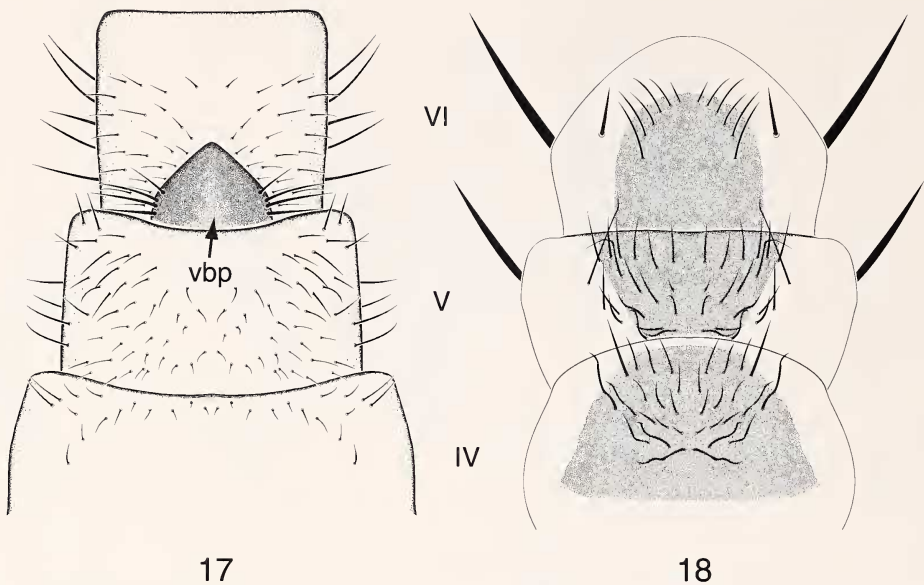
Figure 3 Scatter diagram of measurements of upper width and lower width of ovipositor. Triangles, *Apocephalus similis* Malloch; diamonds, *Apocephalus pergandei* Coquillett; open squares, hypothesized third species (see discussion under *A. pergandei*); closed squares, both *A. pergandei* and hypothesized third species



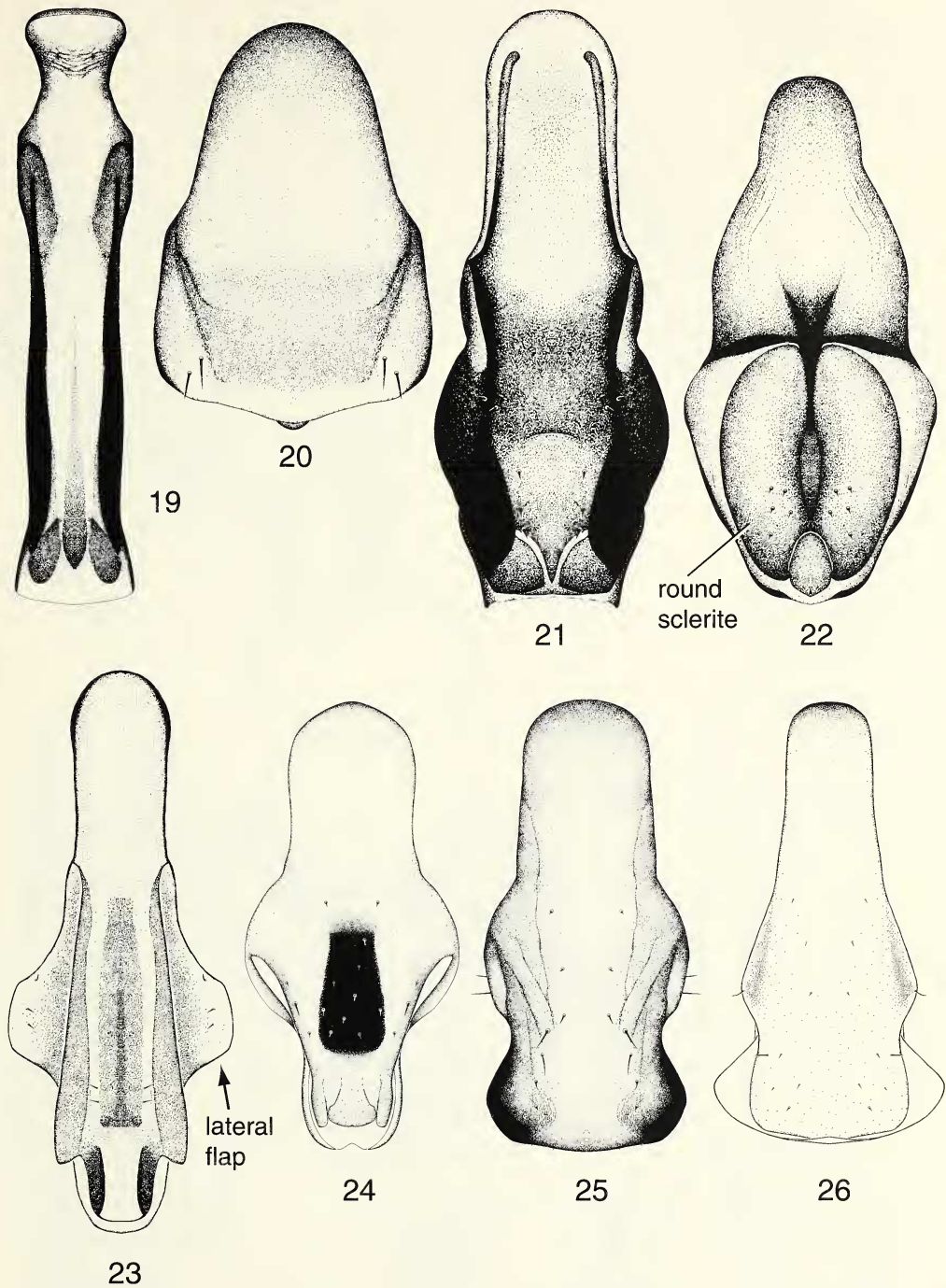
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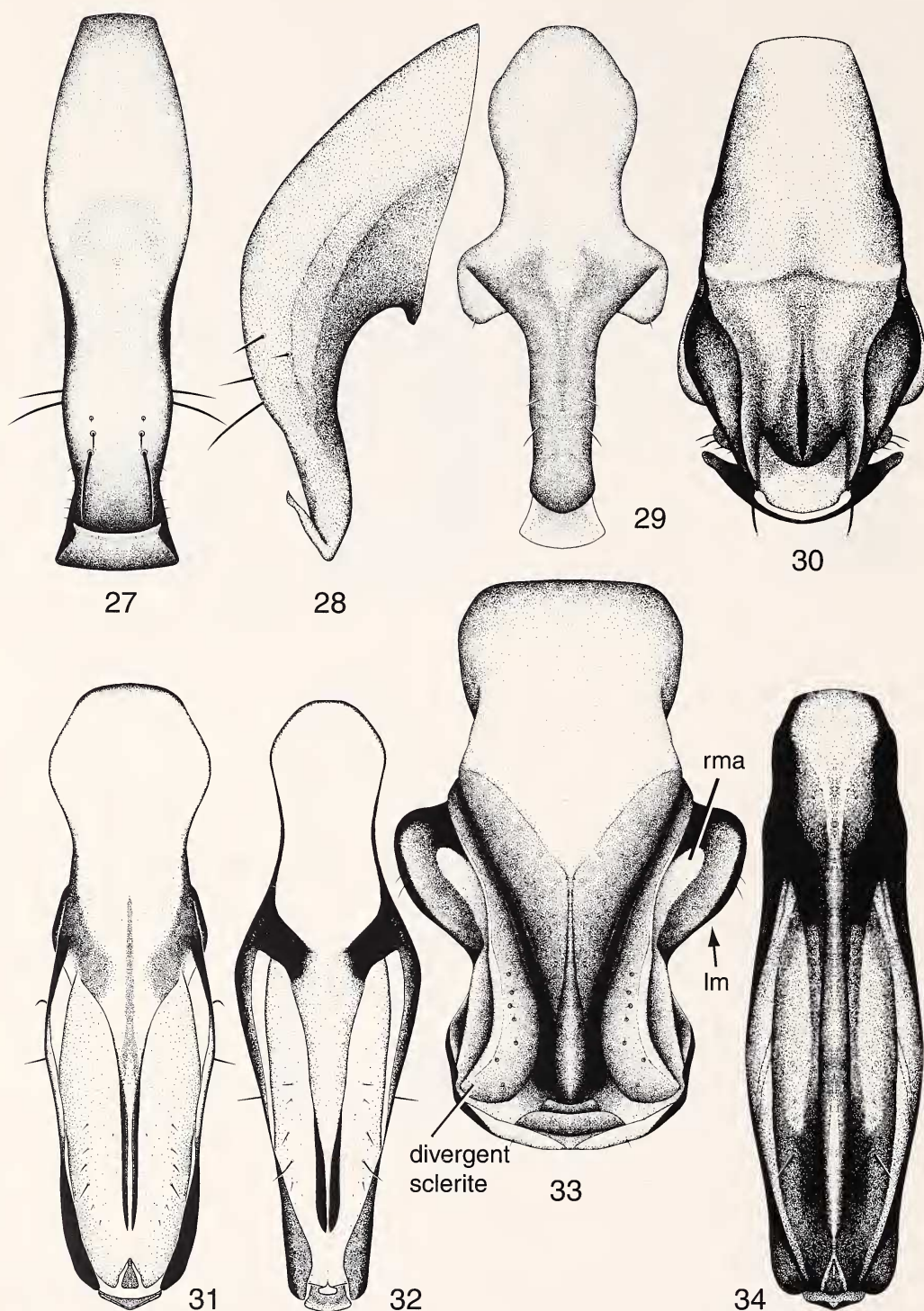
Figures 12–16 Abdomens, ventral. 12. *Apocephalus amplexus* new species. 13. *Apocephalus frameatus* new species. 14. *Apocephalus hispidus* Borgmeier. 15. *Apocephalus aculeatus* Borgmeier. 16. *Apocephalus hystricosus* new species. Abbreviations: IV, abdominal segment 4; V, abdominal segment 5; VI, abdominal segment 6; VI–VII, intersegment 6–7; vbp, ventrobasal process



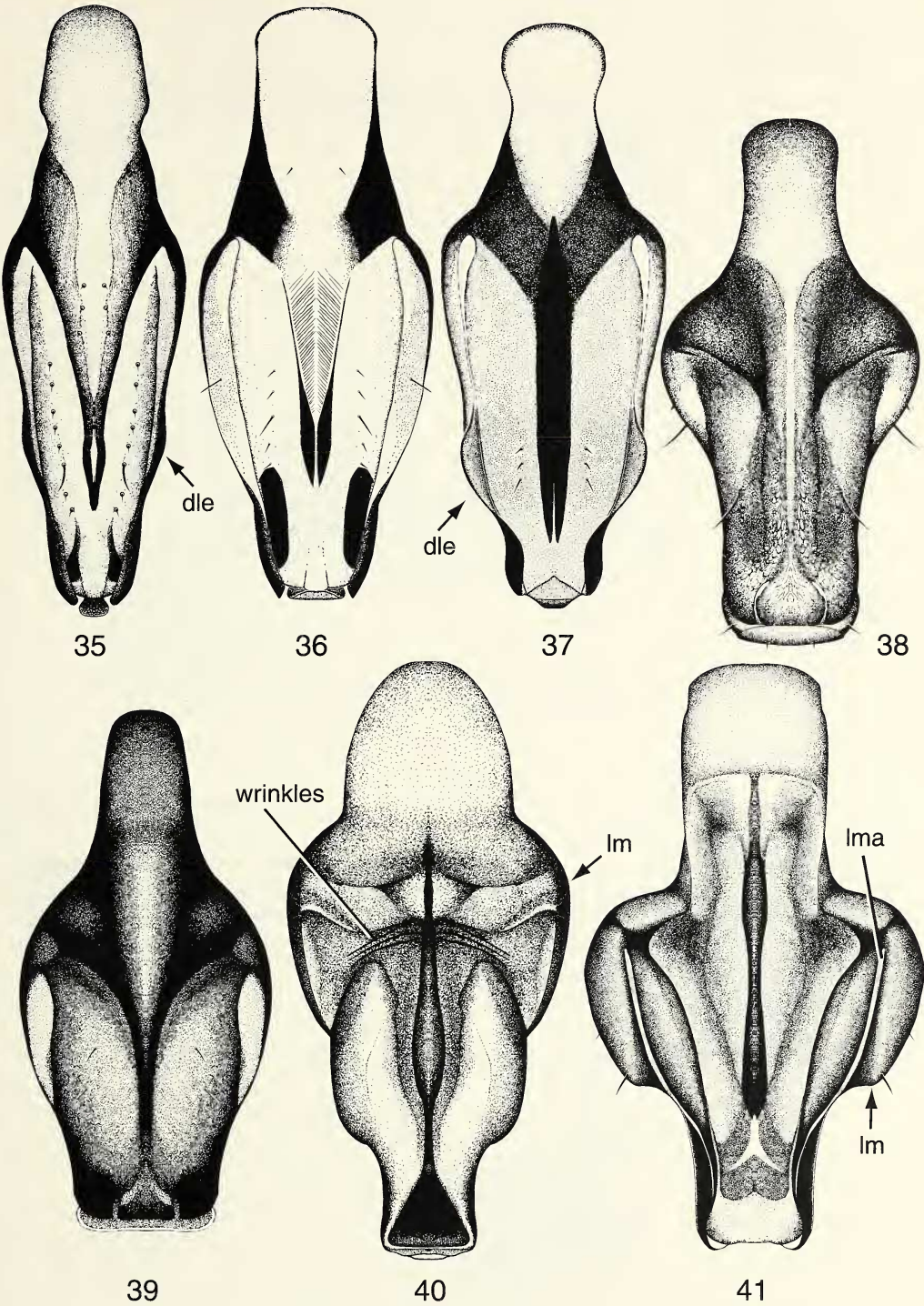
Figures 17, 18 Abdomens, ventral. 17. *Apocephalus vangus* new species. 18. *Apocephalus reburrus* new species. Abbreviations: IV, abdominal segment 4; V, abdominal segment 5; VI, abdominal segment 6; vbp, ventrobasal process



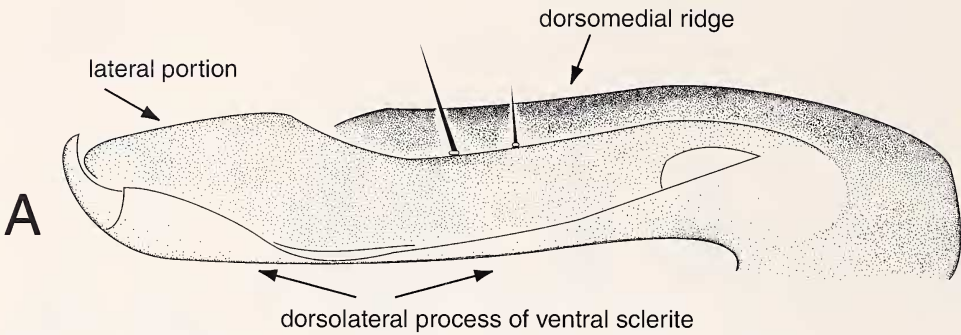
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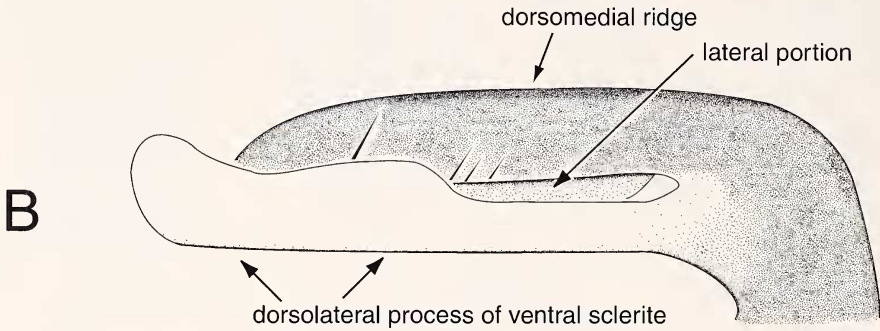
Figures 27–34 Ovipositors. 27, 28. *Apocephalus camponoti* Borgmeier. 27. Dorsal. 28. Right lateral. 29. *Apocephalus crucicauda* Borgmeier, dorsal. 30. *Apocephalus reburrus* new species, dorsal. 31. *Apocephalus aequalis* new species, dorsal. 32. *Apocephalus astrictus* new species, dorsal. 33. *Apocephalus bispinosus* Borgmeier. 34. *Apocephalus bulbosus* new species. Abbreviations: lm, lateral margin; rma, rounded membranous area



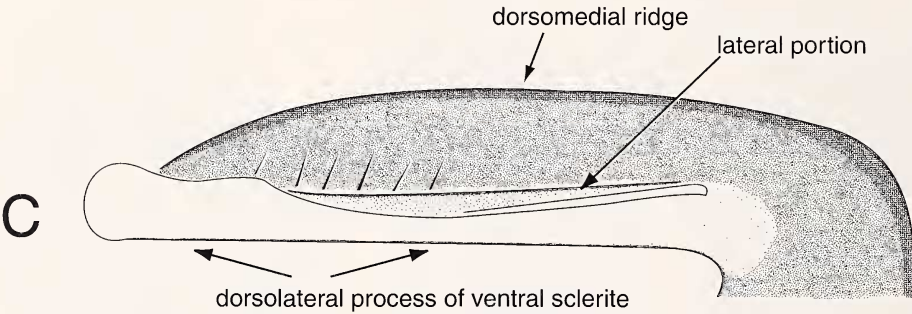
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A. pergandei

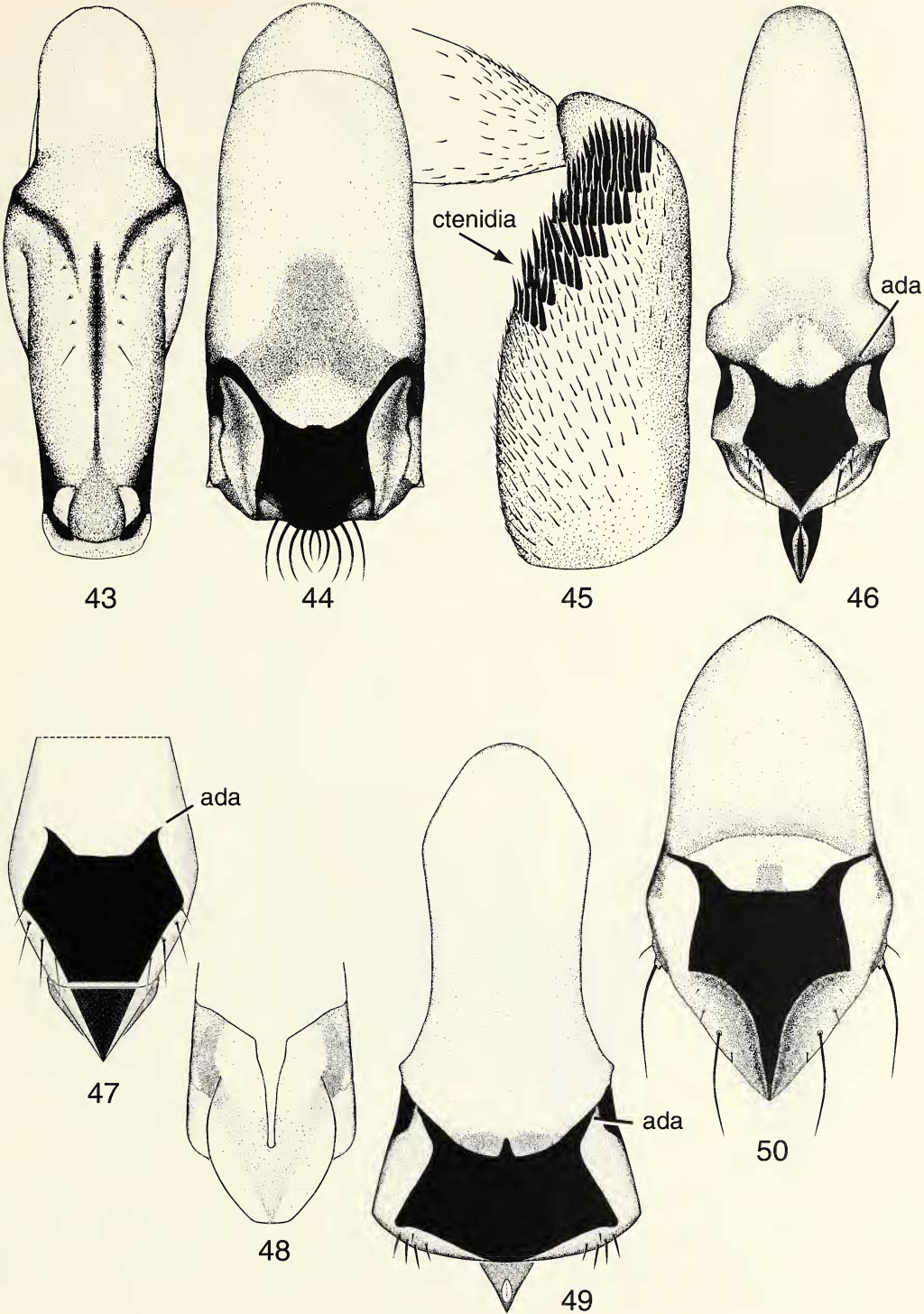


A. cuneatus

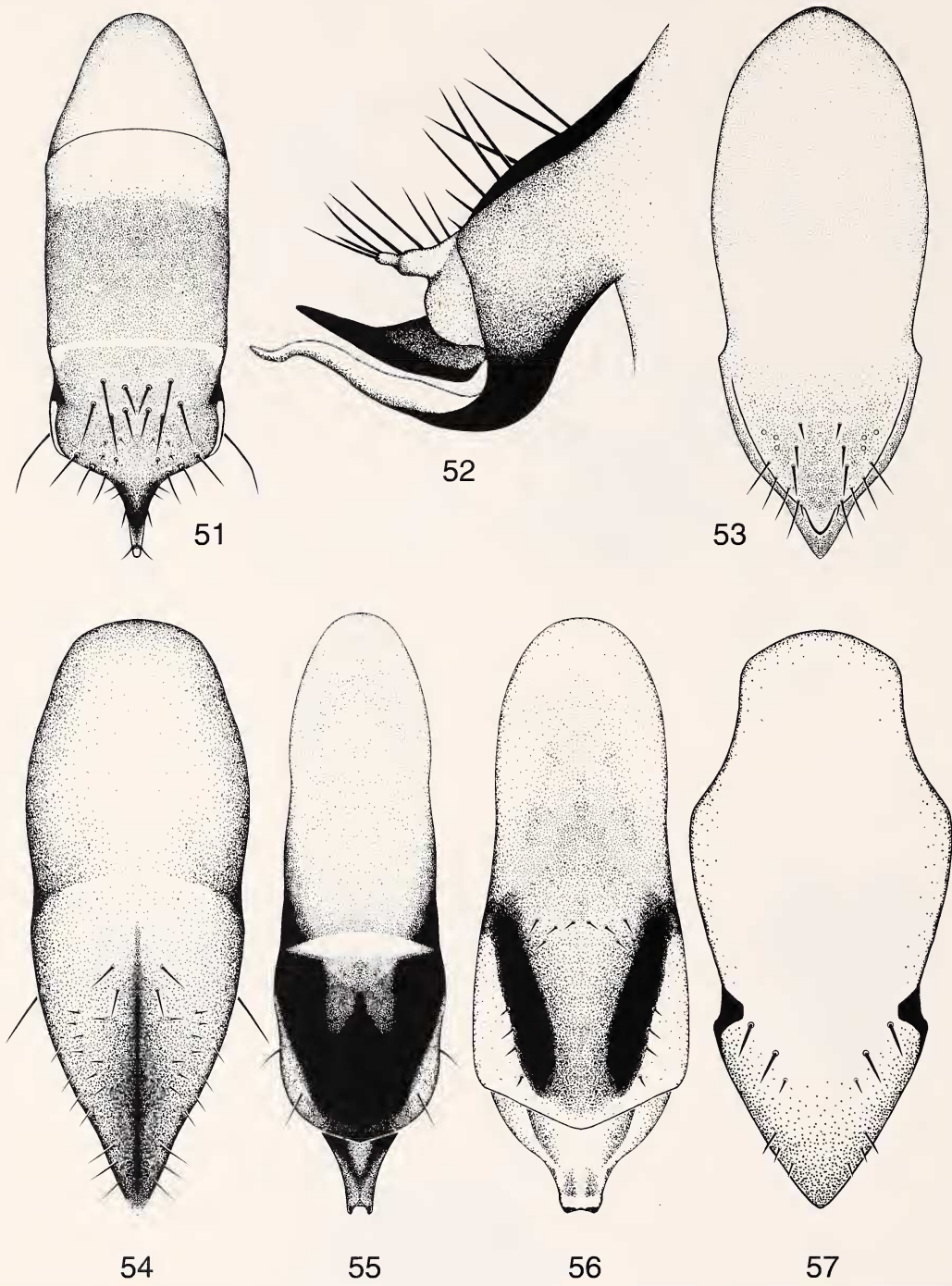


A. bulbosus

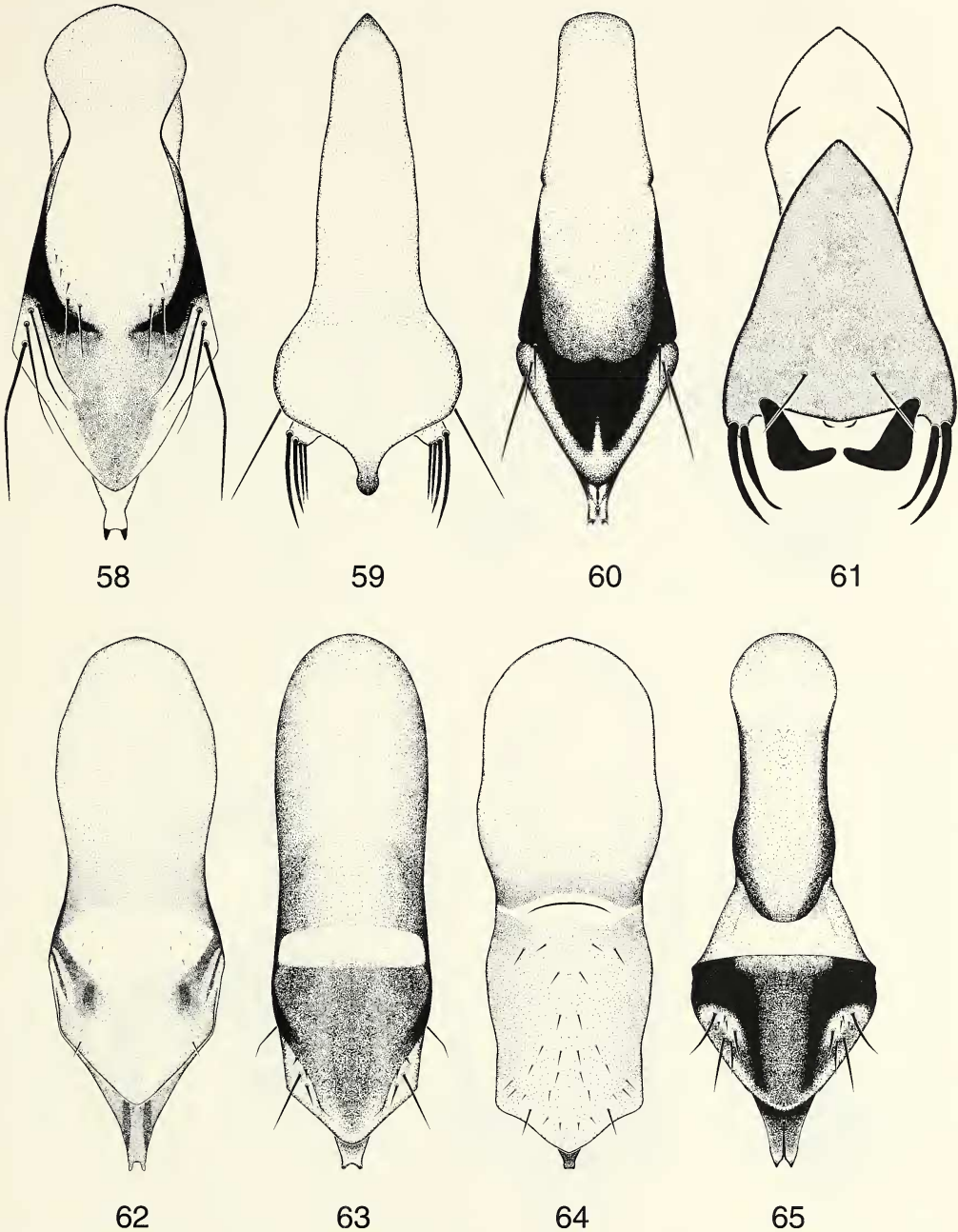
Figure 42 A-C. Ovipositors, lateral



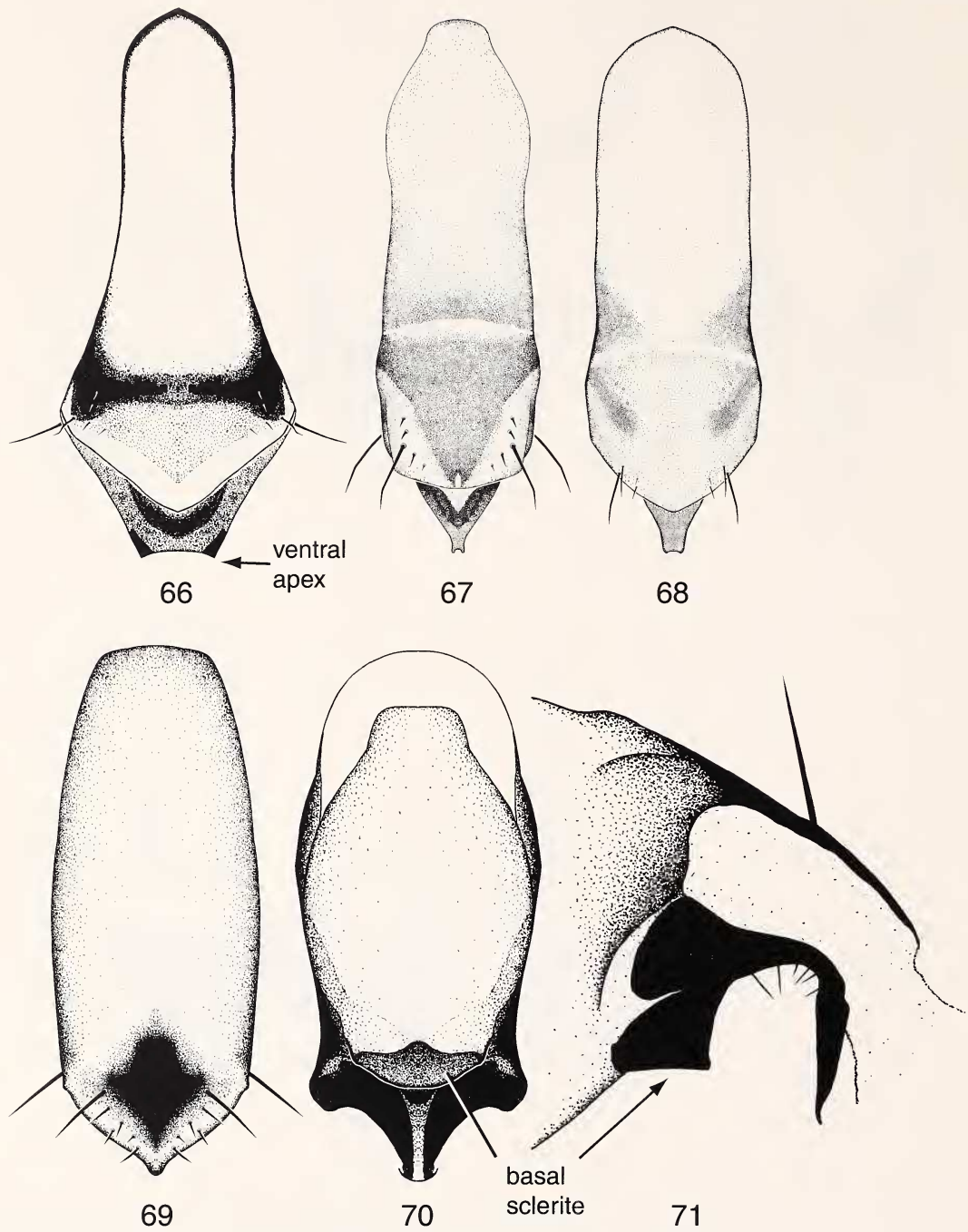
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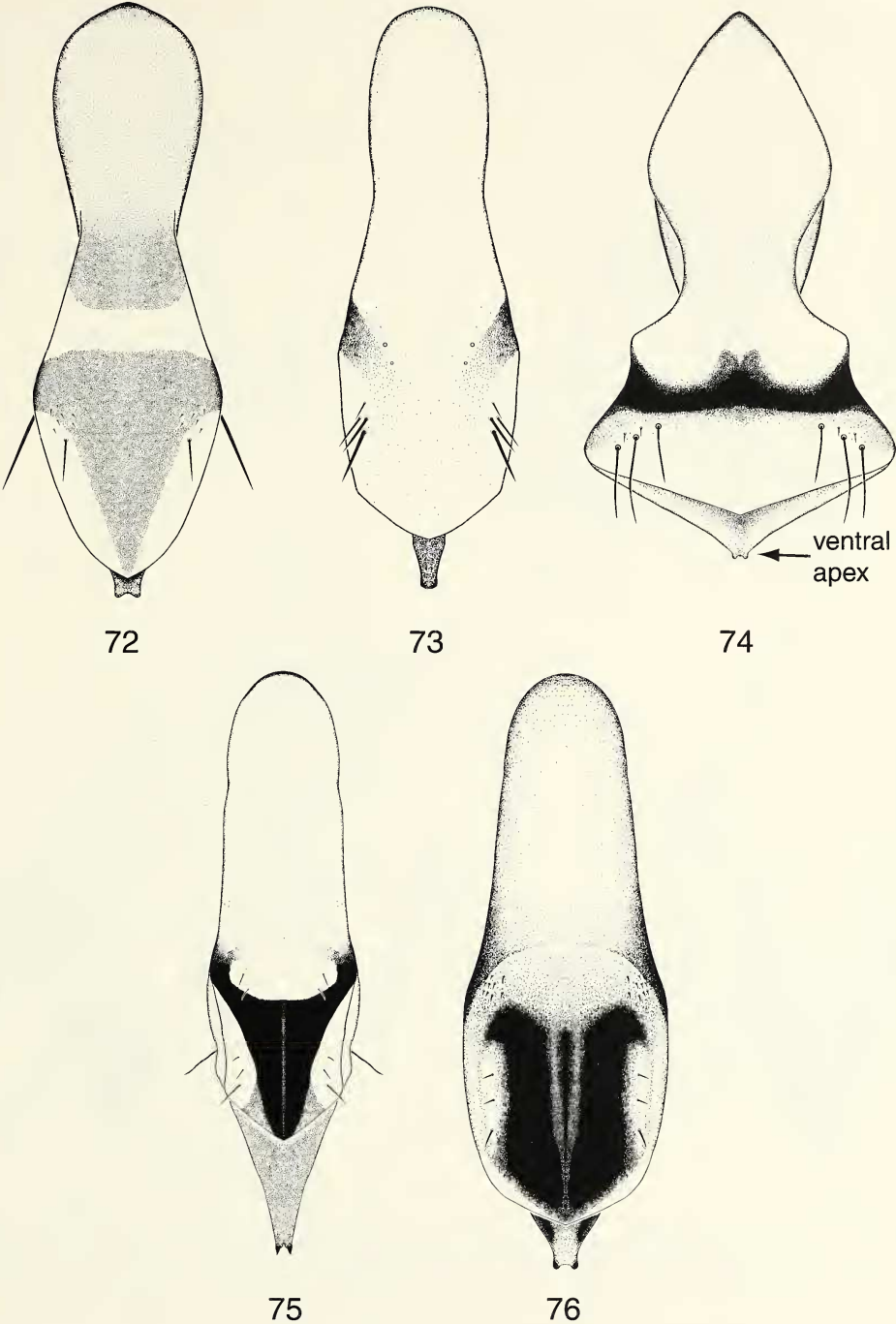
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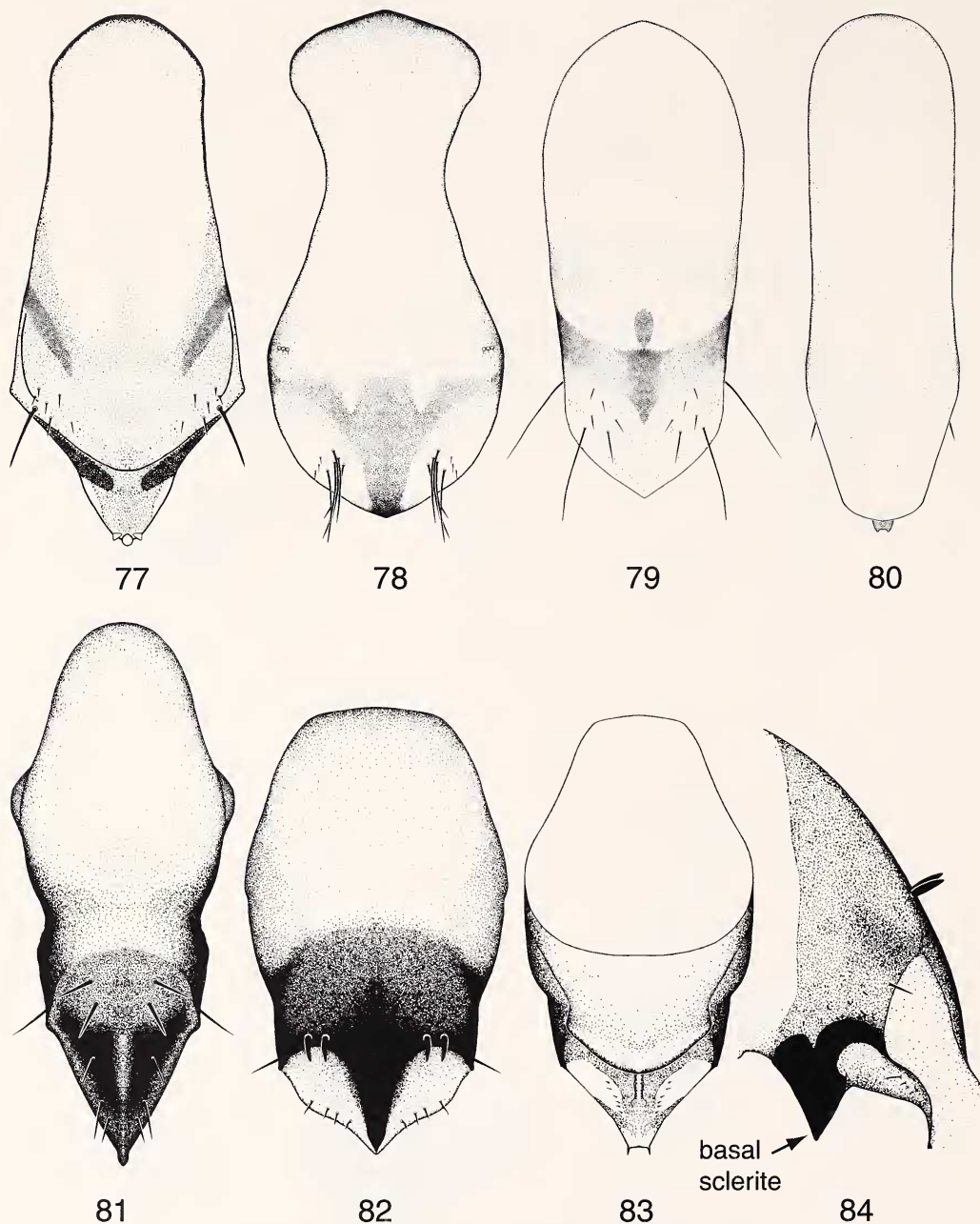
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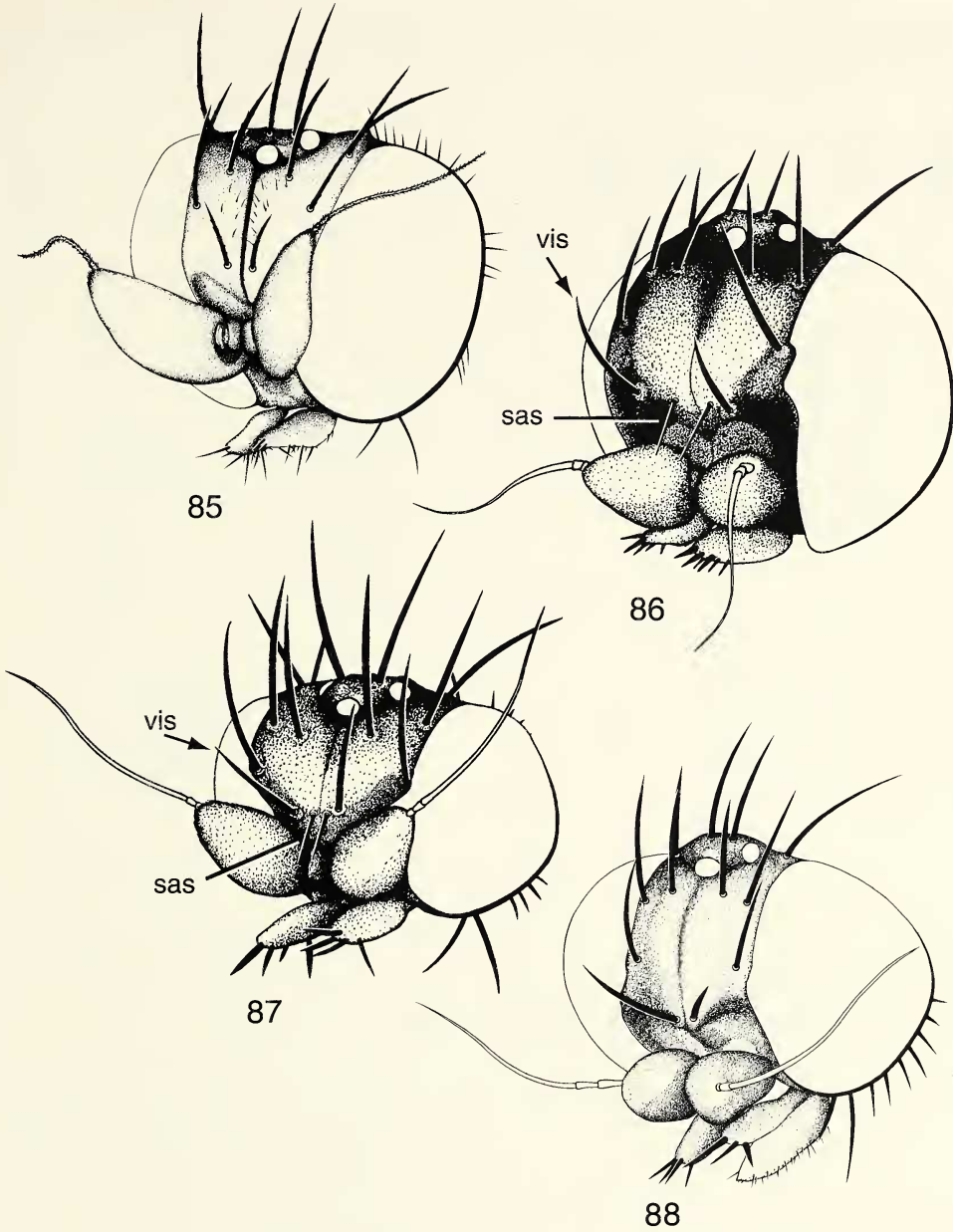
Figures 66–71 Ovipositors. 66. *Apocephalus euryterminus* new species. 67. *Apocephalus flexiseta* new species. 68. *Apocephalus fuscipex* new species. 69–71. *Apocephalus horridus* Borgmeier. 69. Dorsal. 70. Ventral. 71. Left lateral



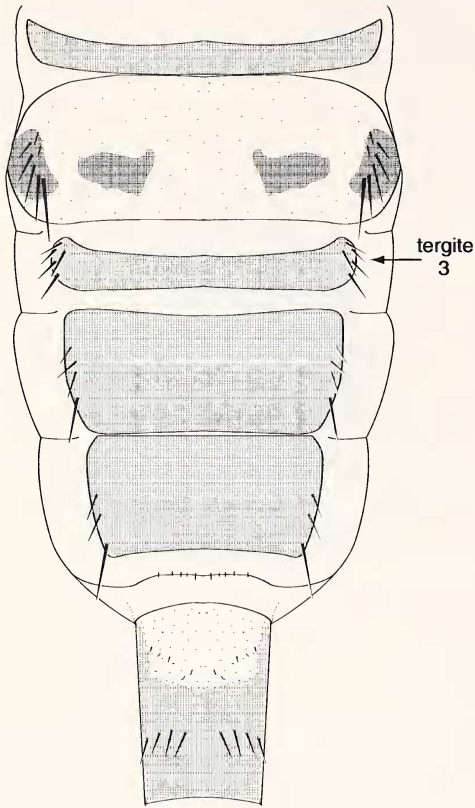
Figures 72-76 Ovipositors, dorsal. 72. *Apocephalus inaffectus* new species. 73. *Apocephalus lanceatus* Borgmeier. 74. *Apocephalus latiapex* new species. 75. *Apocephalus medius* new species. 76. *Apocephalus platycauda* new species



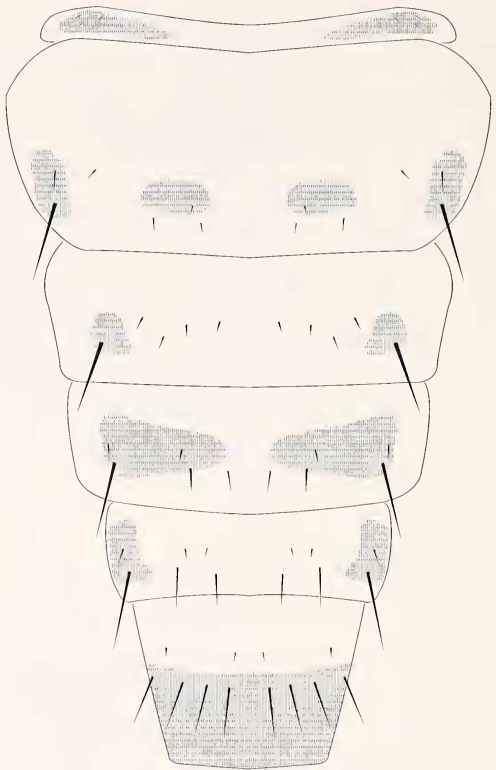
Figures 77-84 Ovipositors. 77. *Apocephalus radiatus* new species, dorsal. 78. *Apocephalus rotundus* new species, dorsal. 79. *Apocephalus setimargo* Borgmeier, dorsal. 80. *Apocephalus sincerus* new species, dorsal. 81. *Apocephalus vicinus* Borgmeier, dorsal. 82-84. *Apocephalus wirthi* Borgmeier. 82. Dorsal. 83. Ventral. 84. Left lateral



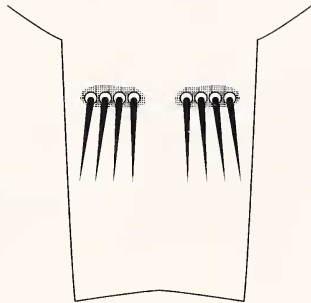
Figures 85–88 Heads, anterolateral. 85. *Apocephalus ctenicoxa* new species. 86. *Apocephalus aquilonius* new species. 87. *Apocephalus horridus* Borgmeier. 88. *Apocephalus wirthi* Borgmeier. Abbreviations: sas, supra-antennal seta; vis, ventral interfrontal seta



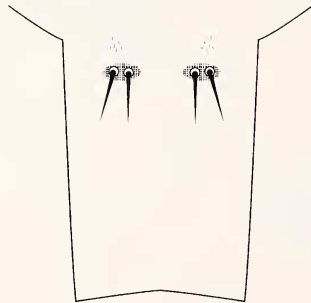
89



90



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92

Figures 89–92 *Apocephalus* species. 89, 90. Abdominal tergites, dorsal. 89. *Apocephalus brevitergum* new species. 90. *Apocephalus setimargo* Borgmeier. 91, 92. Ventral setation of abdominal segment 6. 91. *Apocephalus inaeffectus* new species. 92. *Apocephalus radiatus* new species